

AI AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT**

JULY 1, 1954

In This Issue

**Two New Automatic Transmissions Introduced
High Spots of the SAE Summer Meeting
Producing Splines by New Cold Rolling Process
Gear Manufacturers Hold Annual Session
Automation Principles Used in Valve Production
Automotive Plastics Featured at Exposition**

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A C H I L T O N P U B L I C A T I O N

How a little talk
(with the right person)



The "right person" was E. F. Aschemeyer, at left, Standard Oil lubrication specialist. His practical experience and training helped Elkin solve their problem.



**STANWAY
INDUSTRIAL
OILS**

stopped a lot of
 **chattering**

Chattering and scoring of ways was causing trouble for the Elkin Tool and Manufacturing Company of Detroit. The trouble was noted on a big planer operating under extremely heavy loads. A Standard Oil lubrication specialist recommended the use of STANWAY #95, a very stable oil having extreme oiliness and containing a tackiness agent. Result: smooth operation, complete elimination of chattering and scoring.

STANWAY Industrial Oils were developed to meet the extreme oiliness requirements of certain machine tools which customarily operate under very heavy loads. STANWAY Oils are part of a complete line of industrial oils, cutting oils and coolants that serve all industry.

No matter how "special" your problem may be, there's a Standard Oil product to solve it. There's also a near-at-hand Standard Oil lubrication specialist to help you select and apply the right one. To obtain his services call the Standard Oil office nearest you, or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.



STANDARD OIL COMPANY
(Indiana)

Giant "vacuum cleaner" sweeps shells from ocean floor!



Another "rugged" job for COTTA TRANSMISSIONS

Here's how Cotta Transmissions are used with modern Diesel engines.

Cotta's Model GNR Reduction Gear is used between a 400 hp engine and dredge pump . . . replacing a Diesel-electric drive . . . modernizing and speeding operation of the dredge used for pumping oyster shells out of San Francisco Bay for the manufacture of cement.

For continuous heavy-duty operation and power

transmission jobs ordinary gear boxes can't handle — requiring Single Speed Reduction Units or Multi-Speed forward and reverse — come to Cotta for "engineered-to-order" transmissions, designed to fit available space. Thousands in operation throughout the United States and foreign countries . . . on a wide variety of jobs . . . (on cranes, locomotives, drillers, shovels, etc.) . . . under all types of *tough conditions*. Input torque from 150 to 2500 ft. lbs.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions, and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

**HEAVY-DUTY
TRANSMISSIONS**

"Engineered-to-order"



Fruehauf says . . .

"Stainless Steel Makes America's Finest Trailers"

Yes, austenitic chromium-nickel stainless steel makes possible the finest and, in the long run, the lowest cost trailers you can buy...

Because this tough, high strength, corrosion-resisting metal permits producing a lifetime trailer that gives maximum on-the-road use per dollar invested. Actually, no Fruehauf Stainless Steel Trailer has ever been reported worn out. And consider these advantages:

- extra payload . . . less deadweight
- minimum profit-wasting "down time"
- corrosion-resisting metal never requires painting . . . easy to clean
- permanent beauty
- high trade-in value . . . unmatched performance

Chromium-nickel stainless steel allows you to trim bulk, and make parts much lighter in weight while still providing ample structural strength. Use it where you need high resistance to impact, wear, abrasion and corrosion. Chromium-nickel stainless steels can be drawn, spun, forged, welded, soldered, punched, sheared or bent.

Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. A list of sources of supply will be furnished on request.



The corrugated panels on Fruehauf Stainless Steel Trailers are Type 301 (18-8) Stainless, 15/1000 of an inch in thickness. Though it is very thin, this metal is extremely strong in its corrugated form. Chromium-nickel stainless of different types and thicknesses are used in other parts of the trailer and frame. Product of FRUEHAUF TRAILER CO., Detroit 32, Michigan.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N. Y.

A CHILTON MAGAZINE

PUBLISHED SEMI-MONTHLY

AI

AUTOMOTIVE INDUSTRIES

JULY 1, 1954

VOL. III, NO. 1

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As part of its worldwide automotive and aviation news coverage, AUTOMOTIVE INDUSTRIES is serviced by International News Service and has editorial correspondents in major United States and foreign industrial centers.

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MEMBER

NBP

National Business
Publications, Inc.

ABC

Audit Bureau
of Circulations

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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1952; Dealer and Repairman (monthly) October, 1952; the Automobile Magazine (monthly), July, 1957, and the Horseless Age (weekly), founded in 1905, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, United States Possessions, 1 year \$2.00, 2 years \$3.00. Canadian and Foreign, 1 year \$5.00, 2 years \$8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), \$1.00.

AUTOMOTIVE INDUSTRIES, July 1, 1954

3

"WE CAME BACK TO TEXACO FAST"

... says William Mahoney,
Vice President,
Tyson Bearing
Corporation,
Massillon, Ohio

About three years ago," reports Mr. Mahoney, "we had a chance to make a direct comparison between *Texaco Cleartex Oil* and another brand of dual-purpose oil in our National Acme automatics. This other oil not only discolored and oxidized copper but quickly created a very dirty condition on the lubricating sides of the machines. We came back to Texaco — fast!

"Within a matter of days after the *Texaco Cleartex Oil* went back, the lube sides of the automatics were clean as a whistle again, and we have had no more trouble since that time."

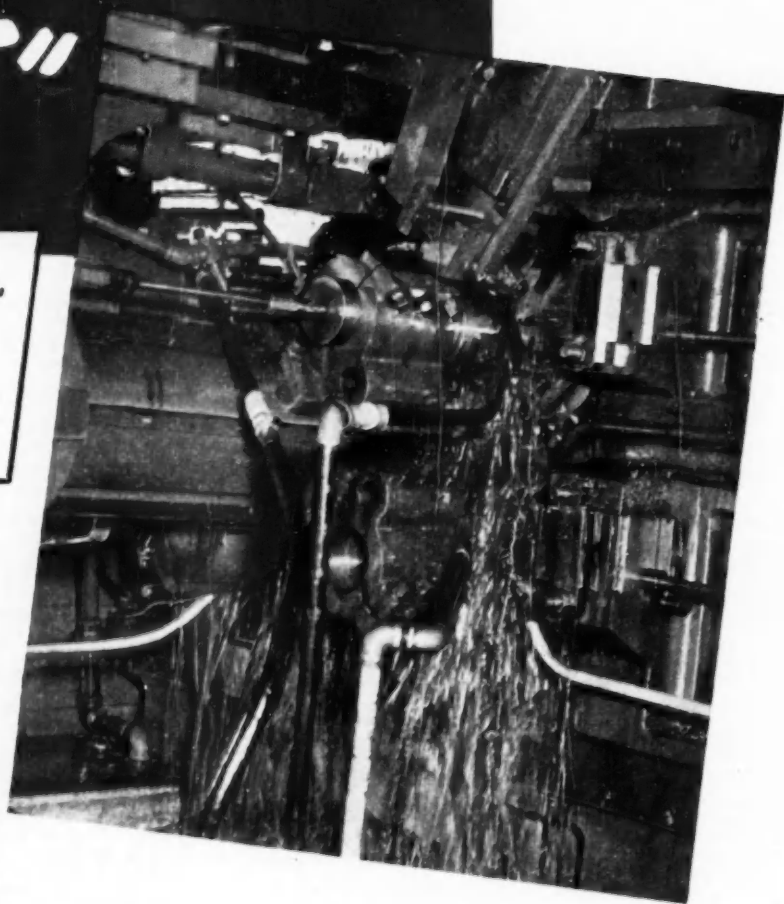
Texaco Cleartex Oil is an exceptionally fine dual-purpose oil for use in automatic screw machines as cut-

ting coolant and machine lubricant. It is just one of the complete line of *Texaco Cutting, Grinding and Soluble Oils* designed to help you do *all* your machining better, faster and at lower cost.

Let a Texaco Lubrication Engineer

specializing in cutting oils help you select the right ones for your jobs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO

CUTTING, GRINDING,
SOLUBLE AND
HYDRAULIC OILS

Save Time...

CHECK and CLASSIFY
with SHEFFIELD Dial Indicator
Adjustable SNAP GAGES

APPLICATIONS:

- Checking work being turned, ground or lapped without removal from the machine.
- Checking and classifying parts at the bench.
- Checking work too large to move.

DURABILITY:

- "Shop-Proof." The most rugged gage of its kind—No frame distortion.

PRECISION:

- Checks work to the accuracy of a "tenth" indicator.
- No skill, no educated sense of feel needed.
- Large dial (2 1/4" dia.) adjustable radially, is easy to read from any angle.

RANGE:

- Indicator range .050".
- Anvil adjustment 1.00".
- Twelve models 1" to 12" capacity.

QUALITY:

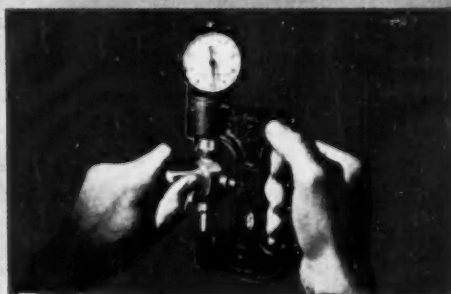
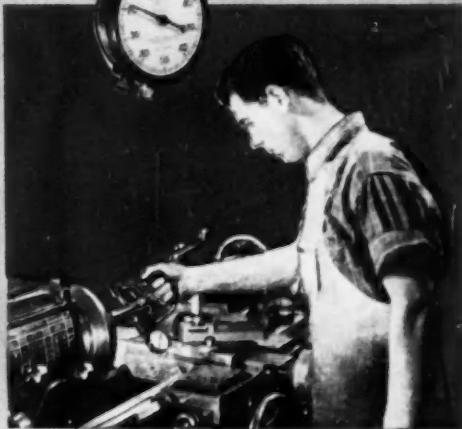
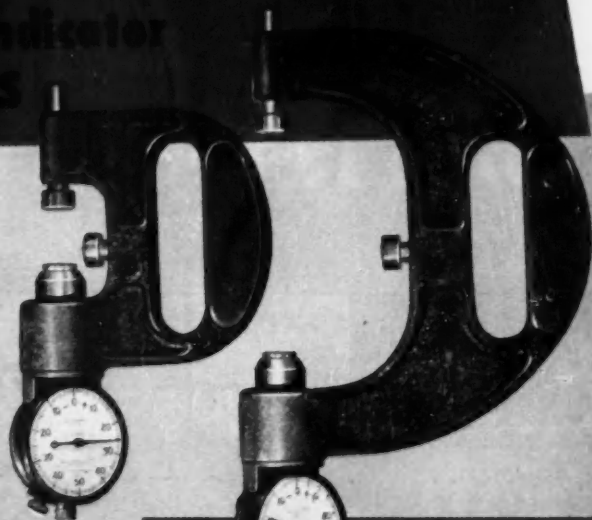
- Made to the highest standard of accuracy by The Master Craftsmen of Sheffield.

DELIVERY:

- Immediate, from stock on the shelf.

Phone your local Sheffield representative for emergency needs. Write for Catalog FG 5455.

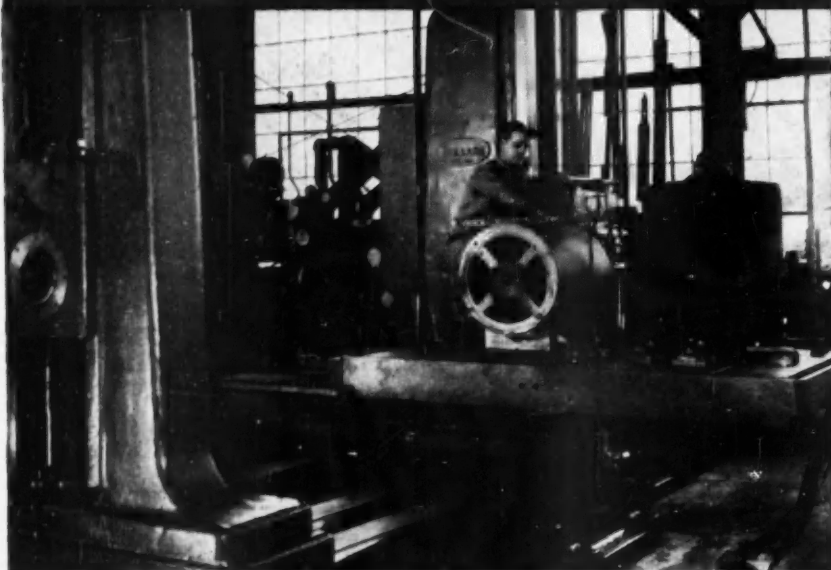
Gage Division, Dept. 2, The Sheffield Corporation,
Dayton 1, Ohio, U.S.A.



SHEFFIELD

6605

MORE YEARS OF BETTER SERVICE



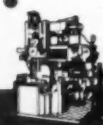
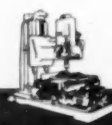
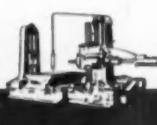
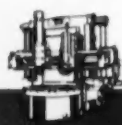
At Phillips Machine Shop in Alliance, Ohio, they rely on Bullard Horizontal Boring, Milling and Drilling Machines. They do general machine work for a number of major manufacturers in this highly industrialized northern Ohio area.

"I choose Bullard," says Mr. Donald Phillips, owner, "because it is the best boring mill on the market. I have carefully checked other domestic and foreign makes. None of them have the weight, the solidity and the reliability of the Bullard machine."

at Low Cost



Investigate
BULLARD —
if you're looking
for a versatile,
rugged horizontal
boring, milling and
drilling machine
with "built-in"
accuracy and
efficiency. Have
your Bullard
representative
explain
its many features
or write to



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Above and beyond the *quality* you require in your cable and wiring assemblies, it is important to choose a manufacturer who can give you such *plus advantages* as experienced engineering counsel and on-time delivery. Often it is intangibles such as these that help keep your production lines going.

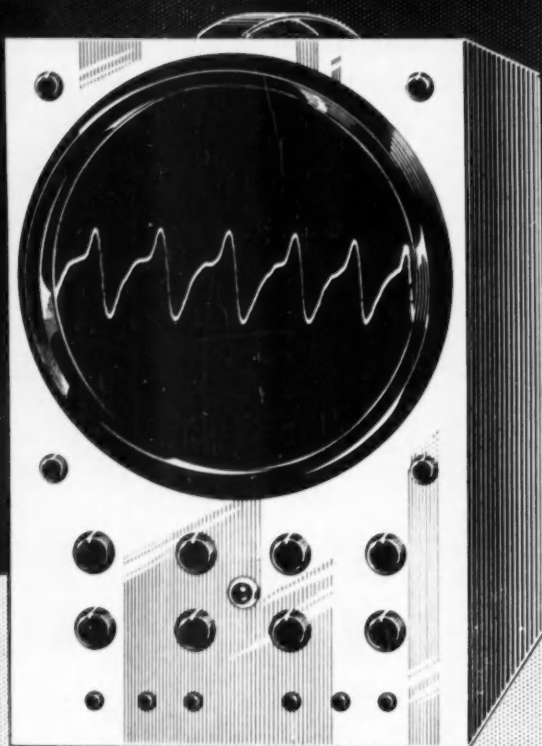
Consider Packard as a source

The wide use of Packard cable and wiring assemblies on America's foremost automotive vehicles, aircraft and appliances is your assurance of top quality. Packard's vast manufacturing capacity—more than 7,000,000 feet of finished cable and 800,000 wiring assemblies each day—is your assurance of regular delivery in any quantity you demand. And Packard's engineering ability assures cable and wiring assemblies correctly designed and fabricated to suit your requirements. These are factors that often result in worthwhile savings to Packard customers.

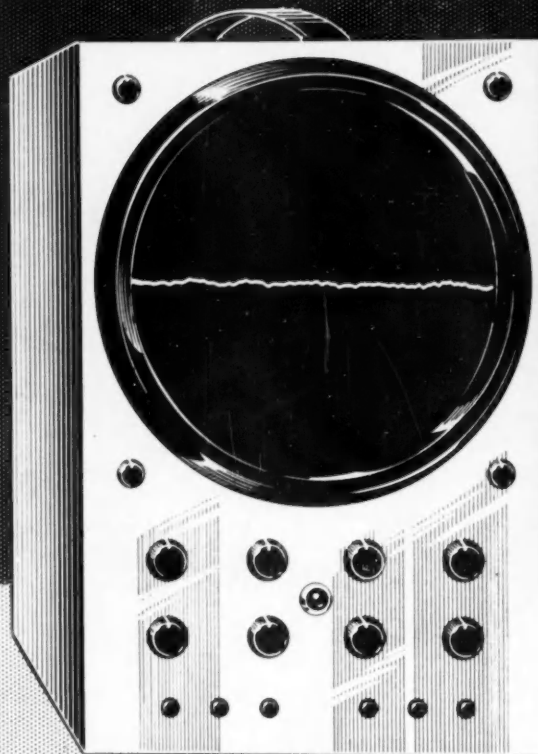


Packard Electric Division • General Motors Corporation • Warren, Ohio

AUTOMOTIVE, AVIATION AND APPLIANCE WIRING



WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008" jump at frequency of 2.74 cycles per second was noted.



WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel

and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-7.

**INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY**



PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL
Refiners of the famous Blue Sunoco Gasoline and Dynalube Motor Oils

Another New Delpark Development

Delpark Settling and Filter

SYSTEM

FOR CONTINUOUS REMOVAL OF CHIPS, HEAVY SOLIDS AND
RELATIVELY FINE SOLIDS TO .004" SCREENING

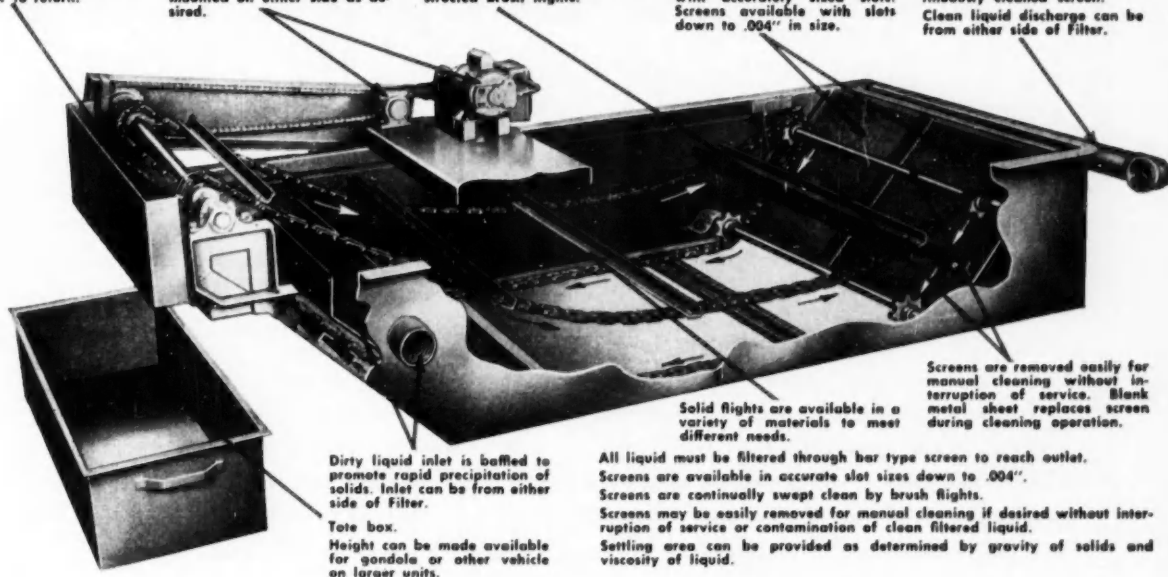
Special cleaning device (not shown) removes solids from flights prior to return.

Motor drive is through separate reduction gears. May be mounted on either side as desired.

Screen is continuously swept clean with specially constructed brush flights.

To reach outlet all liquid must pass through bar type screen with accurately sized slots. Screens available with slots down to .004" in size.

Clean liquid outlet following flow through bar type, continuously cleaned screen. Clean liquid discharge can be from either side of filter.



Dirty liquid inlet is baffled to promote rapid precipitation of solids. Inlet can be from either side of filter.

Tote box. Height can be made available for gondola or other vehicle on larger units.

Solid flights are available in a variety of materials to meet different needs.

All liquid must be filtered through bar type screen to reach outlet. Screens are available in accurate slot sizes down to .004".

Screens are continually swept clean by brush flights.

Screens may be easily removed for manual cleaning if desired without interruption of service or contamination of clean filtered liquid.

Settling area can be provided as determined by gravity of solids and viscosity of liquid.

The DELPARK Settling and Filter System is engineered for the filtration of particles .004" or larger. It is made for the filtration of liquids of varying degrees of viscosity containing solids of different particle sizes and widely differing weights. Size of the equipment is dependent up-

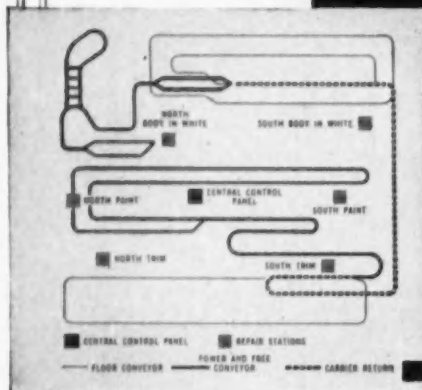
on the settling rate which in turn is governed by the gravity of the solids and the viscosity of the liquid. This factor determines the retention period for a given rate of flow.

Write today for more information on this newest development in DELPARK Industrial Filtration.

Delpark INDUSTRIAL FILTRATION

BACKED BY MORE THAN 30 YEARS EXPERIENCE IN INDUSTRIAL FILTRATION

INDUSTRIAL FILTRATION COMPANY, 19 INDUSTRIAL AVENUE, LEBANON, INDIANA



Five miles of Conveyors controlled by one man.

Automatically A Body A Minute

This enormous Detroit plant, floor space 1,100,000 ft., has been modernized to make it one of the most advanced body building plants in the industry. Keynote of body making here is 8 miles of conveyors skillfully synchronized by means of electronic controls to automatically deliver 60 finished bodies an hour.

One of the most impressive features of this operation is a fully automatized conveyor system in the body painting department. Here a central electronic panel operated by one man controls a 26,000 ft. system of 56 conveyors. Centralized electronic control was selected to economically hold production delays to a minimum.

Bodies start through finishing on floor conveyors; a semi-automatic device later picks up these bodies and transfers them to overhead "Power and Free" conveyors for painting; after painting, bodies are automatically set on floor conveyors for final processes. This flexible conveyor system has adequate surge-type storage banks and by-pass facilities for all production variations.

Whether your operation calls for systematic handling of items as large as auto bodies or something considerably smaller, you will find the extensive engineering knowledge and manufacturing facilities of Jervis B. Webb Company can provide a better answer to your needs.

Additional Webb Services—Through its subsidiaries, Control Engineering and Webb Forging Co., the Jervis B. Webb Co. designs and manufactures electronic and electrical controls for conveyors, machine tools, etc. Also quality drop forgings.

JERVIS B. WEBB CO.
Conveyor Engineers and Manufacturers
8937 ALPINE AVENUE • DETROIT 4, MICHIGAN

Send for fully
illustrated catalog
that provides com-
plete information
on Webb conveyors

OFFICES IN PRINCIPAL CITIES OF THE WESTERN HEMISPHERE AND LONDON, ENGLAND
FACTORIES: DETROIT • LOS ANGELES • HAMILTON, ONTARIO

Fay Automatic Lathes add
HI-VELOCITY TURNING to **AUTOMATICITY**
with results like this...

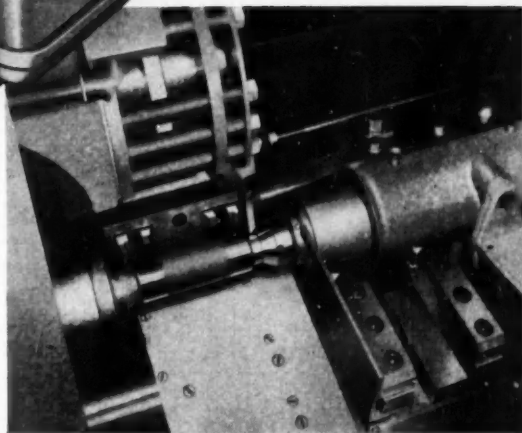


TRACK LINK BUSHINGS
324 per hour — 780 SFM

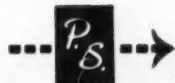
Operator merely loads the hopper feed and pushes the cycle start button. Operation is completely automatic. Both ends are turned at 780 SFM. At the end of the turning cut, driving jaws recede. Driving fixture and tailstock are withdrawn, the finished piece is removed from the machine by an inclined chute, and the cycle repeats.

As a safety feature, a limit switch stops the machine whenever there are fewer than three pieces in the hopper feed.

Modern Fay Automatic Lathes like this are the result of J&L's 24 years' experience in automaticity. They dramatically illustrate what can be achieved *when Hi-Velocity Turning is added to Automaticity.*



Only minor tool adjustments are necessary to machine six different sizes of bushings on this 12" Fay Automatic Lathe with mechanical loading and unloading.



Write today for the new Jones & Lamson booklet — "Production Seminars" — which discusses Hi-Velocity Turning as demonstrated on our production lines in Springfield.

JONES & LAMSON

JONES & LAMSON MACHINE CO., 523 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

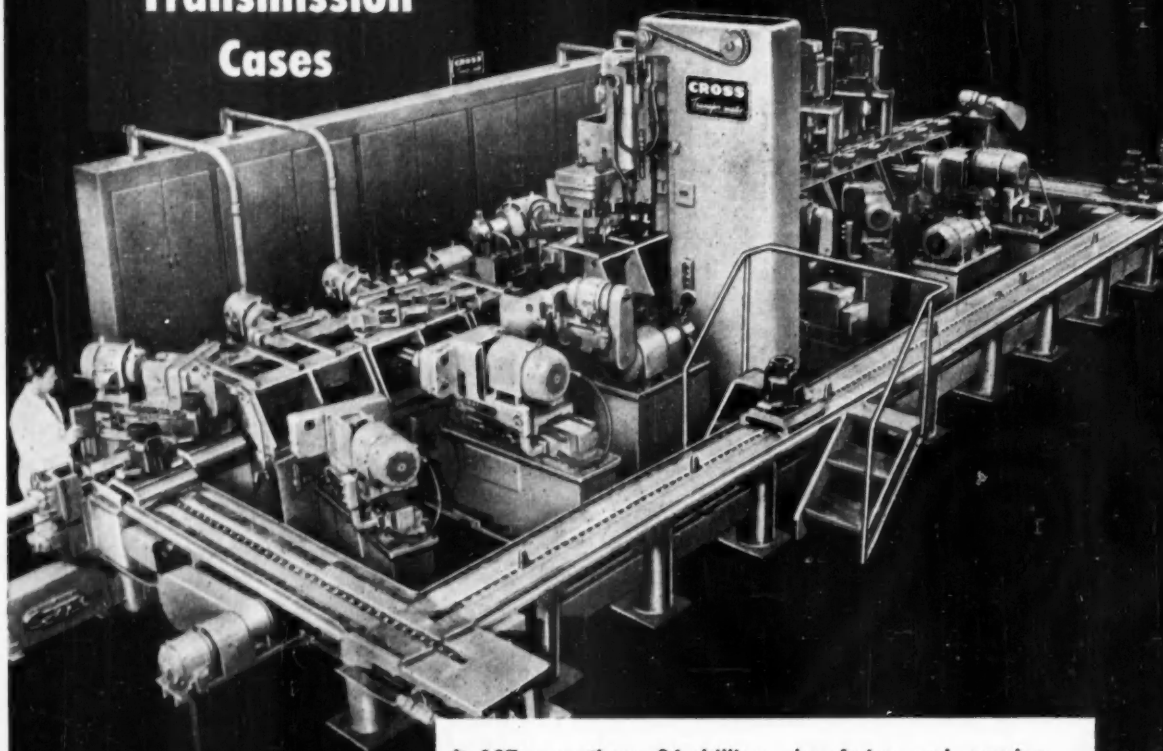


*Machine Tool Craftsmen
 Since 1835*

MACHINE TOOL DIV.

**Drills, Bores,
Reams and Taps
Transmission
Cases**

Another Transfer-matic by Cross

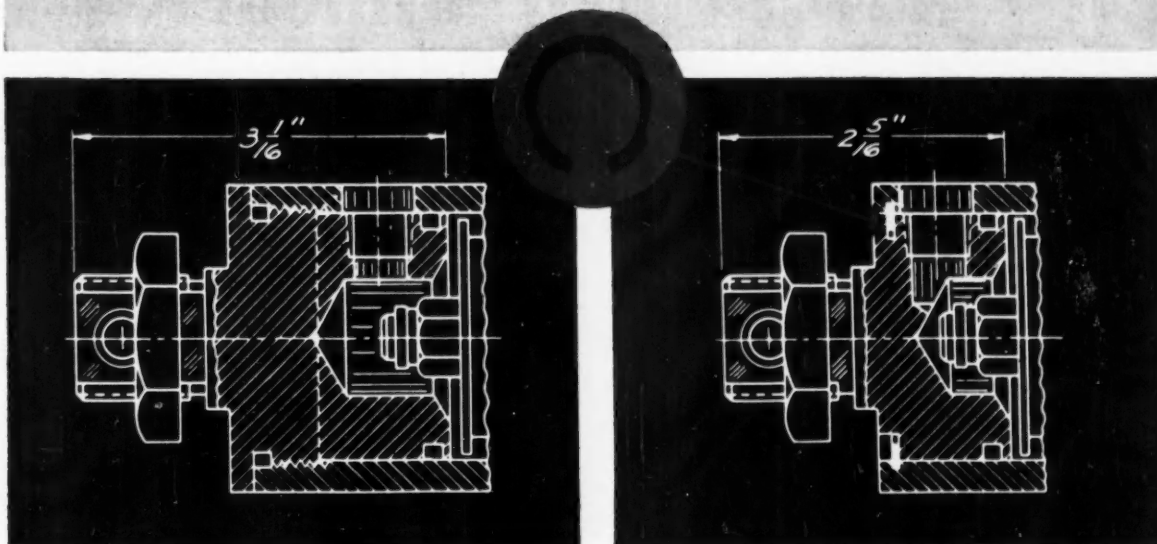


- ★ 107 operations: 84 drilling, chamfering and reaming, 8 spotfacing and counterboring, 4 boring, 6 tapping, 5 inspection.
- ★ 95 parts per hour at 100% efficiency.
- ★ 21 stations: 1 for loading, 1 for unloading, 15 for machining, 4 idle.
- ★ Machine stops automatically if critical tools are broken or improperly set for depth.
- ★ Pallet type work holding fixtures with automatic transfer from station to station and integral conveyor for automatic moving from unloading to loading station.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Hardened and ground ways, built-in chip conveyors, hydraulic feed and rapid traverse, individual lead screw feed for tapping, automatic lubrication and J.I.C. construction.

Established 1898

THE **CROSS** CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

Waldes Truarc Rings Cut Costs \$3.26 per Unit, Reduce Size and Weight of Air Cylinder!



OLD STYLE air cylinder, with thread-secured head, required costly tapping, chasing and assembly operations. Also, satisfactory maintenance of packing unit necessitated use of pipe wrenches on painted surfaces.

NEW cylinder head is secured with precision-ground Waldes Truarc Rings. This produces perfect alignment of head within the housing, difficult to obtain with screw-thread seating. Maintenance is quick and easy.

WALDES TRUARC RINGS PERMITTED THESE SAVINGS

Production Time Cut...17 minutes
Weight Saved.....1 1/4 lb.
Length Shortened.....1 1/2 inches
Cost Saved.....\$3.26 unit

■ The A. K. Allen Company of Brooklyn, New York, maker of AllenAir cylinders, now uses two Waldes Truarc Inverted Rings (series 5008) to secure heads rigidly within tubes.

■ TRUARC Rings, in this application, are ground parallel by A. K. Allen to .001 tolerance. In a static hydraulic bursting test, the 3" unit (recommended for 350 p.s.i.) withstands a pressure of 2000 p.s.i. And at bursting-point, the brass

groove gives way; the Truarc Ring remains intact.

■ Waldes Truarc Retaining Rings are precision-engineered... quick and easy to assemble and to disassemble. They can be used over and over again. There's a Waldes Truarc Ring to answer every fastening problem.

■ Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool



SEND FOR NEW CATALOG ➔

**WALDES
TRUARC**
REG. U. S. PAT. OFF.
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,416,852; 2,420,921; 2,438,341; 2,439,789; 2,441,846; 2,455,165; 2,463,380; 2,463,383; 2,467,802; 2,467,803; 2,491,306; 2,509,081; AND OTHER PATENTS PENDING.



Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

Name.....

Title.....

Company.....

Business Address.....

City..... Zone..... State.....

How Heat-Treatment Affects Alloy Steels

This is the fourth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

There are in general five different forms of heat-treatment used with hot-rolled alloy steel. These treatments modify the mechanical properties of the steel to suit the end use. Basically, heat-treating may be defined as an operation or series of operations involving the heating and cooling of steel in the solid state to develop the required properties.

The five forms of treatment mentioned above, as applied to constructional alloy steels, are discussed in the following paragraphs:

(1) QUENCHING AND TEMPERING usually consists of three successive operations: (a) heating the steel above the critical range, so that it approaches a uniform solid solution; (b) hardening the steel by quenching it in oil or water; and (c) tempering the steel by reheating it to a point below the critical range in order to effect the proper combination of strength and ductility.

(2) NORMALIZING is a form of treatment in which the steel is heated to a predetermined temperature above the critical range, after which it is cooled slowly to below that range in still air. The purpose of normalizing is to promote uniformity of structure and to alter mechanical properties.

(3) ANNEALING consists of heating the steel to a point at or near the critical range, then cooling at a predetermined rate. Annealing is used to develop softness in steel, to improve machinability, to reduce stresses, to improve or restore ductility, and to modify other properties.

(4) SPHEROIDIZE-ANNEALING is the prolonged heating of steel at an appropriate temperature, followed by slow cooling to produce a globular condition of the carbide. This treatment produces a structure which may be desirable for machining, cold-forming or cold-drawing, or for the effect it will have on subsequent heat-treatment.

(5) STRESS-RELIEVING is the process of reducing internal stresses by heating the steel to a temperature below the critical range and holding for a time interval sufficient to equalize the temperature throughout the piece. The object of this treatment is to restore the elastic properties of the steel, or to reduce stresses that may have been induced by machining, cold-working, or welding.

Bethlehem metallurgists have had long experience in all methods of heat-treating. They understand the possibilities and limitations of each method with respect to various alloy steels. These men will be glad to give advice or help you with any problems concerning heat-treatment. Always feel free to ask for their services.

And call on Bethlehem, too, for the full range of AISI standard alloy steels, as well as special-analysis steels and all carbon grades. We can meet your needs promptly.

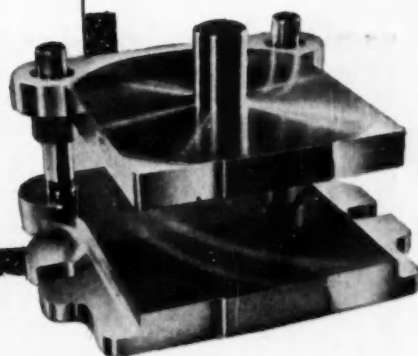
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM *ALLOY* STEELS



World's fastest die set service in action



Now—Danly unites mass production techniques with the precision touch of craftsmanship to bring you the fastest die set service... ever.

Never before has there been a die set service as fast as the one that Danly now offers to you. Unique in concept, the system had its beginning some years ago when Danly originated its network of nationwide Danly Branches. Under such a system the main Danly Plant in Chicago provided thousands of *interchangeable* die set parts to Danly Branch Plants. It meant that such parts were easily assembled into standard die sets and then quickly delivered to meet the requirements of any tooling program. But, as buyers recognized the convenience of Danly service, demands on the Chicago Plant grew to exceed capacity. The solution?... an unprecedented move in the die set field. Danly put die set manufacture on a mass production basis with no sacrifice of famous Danly precision. It was accomplished with amazing new facilities in the form of two complete production lines devoted exclusively to high speed, precision die set production. The next time you put one or a dozen Danly Die Sets on order, expect to get fast delivery from any Danly Branch, expect to get die sets unequalled in precision. You can expect it and you'll get it... when it's Danly.

Here's where faster die set service begins, on Danly's high speed precision production lines... the finest mass production facilities in the die set field.



Fast, nationwide delivery from these plants

*CHICAGO 50	2100 S. Laramie Avenue
*CLEVELAND 14	1550 East 33rd Street
*DAYTON 7	3196 Delphos Avenue
*DETROIT 16	1549 Temple Avenue
*GRAND RAPIDS	113 Michigan Street, N.W.
*INDIANAPOLIS 4	5 West 10th Street
*LONG ISLAND CITY 1	47-28 37th Street
*LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
*PHILADELPHIA 40	511 W. Courtland Street
*ROCHESTER 6	33 Rutter Street

*Indicates complete stock.

Here's where your order is received... in one of Danly's Branch Plants. Because all die components are close at hand, your order is filled immediately.



50th ANNIVERSARY - POWERED CARRIAGES

50th ANNIVERSARY - POWERED FLIGHT

Some of the great names in the Motor Car Industry recently celebrated their 50th Anniversary and now the Aircraft Industry relates its dramatic and enchanting history of Powered Flight over a fifty-year period. • The astounding growth of these two industries would have been impossible without Forgings which are used wherever maximum strength with minimum weight is essential. • Wyman-Gordon has been privileged to serve these industries from their beginning . . . has kept abreast of progress and has pioneered many advancements in Forging and Heat Treating techniques and in quality control. • There is no substitute for a Forging - and in a Forging there is no substitute for Wyman-Gordon quality and experience.

WYMAN-GORDON

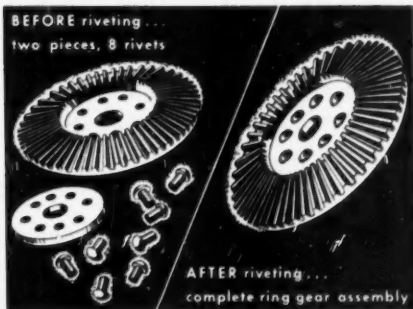
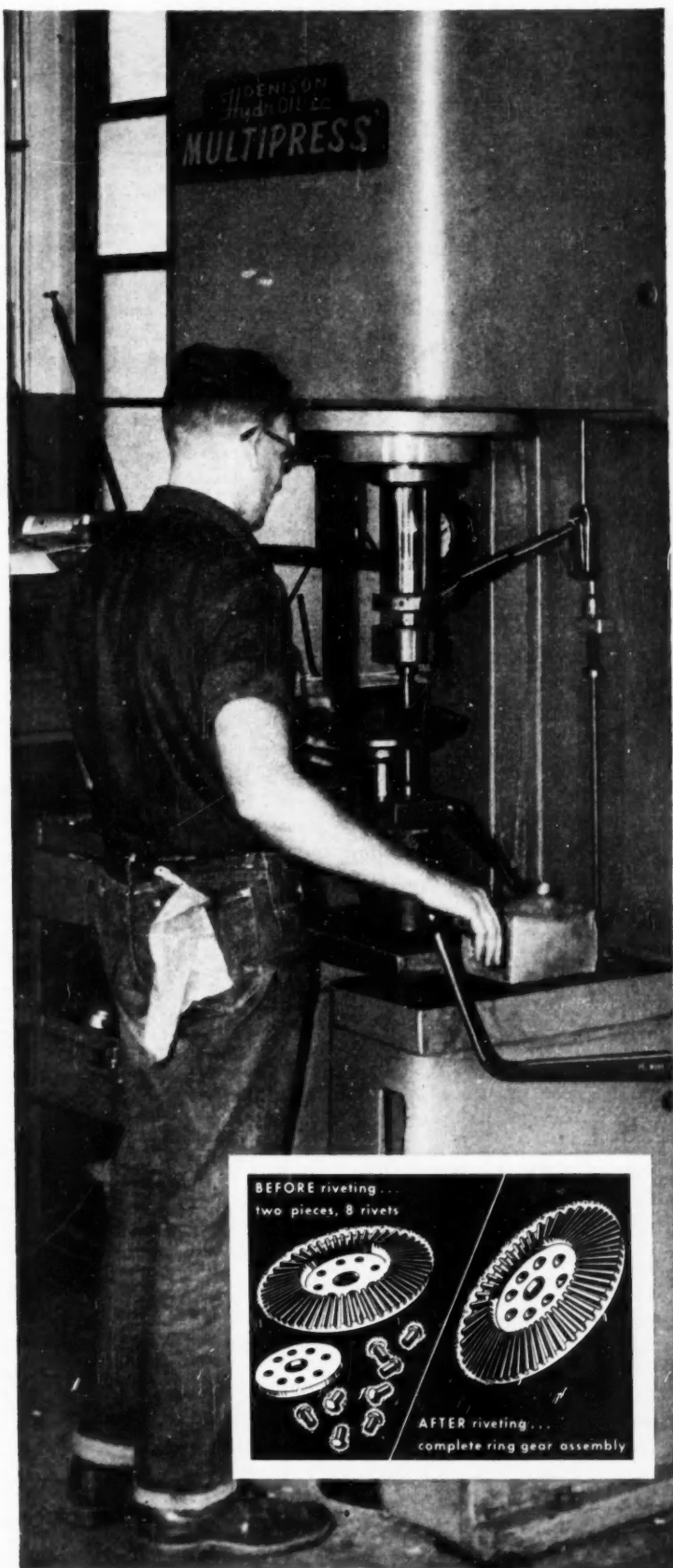
Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

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One man,
one **DENISON**
MULTIPRESS®
... 9 times
the production
per man

At Barber-Greene Company, they've tripled production for riveting together two halves of a ring gear assembly.

With former hot rivet method, the best a three-man team could do was 10 assemblies an hour. The operation was slow, noisy. Distortion from heat made a boring operation necessary.

With cold riveting, using Denison's hydraulic Multipress, flow of metal is better, more uniform. There's no heat, no warpage. One operator rivets 30 assemblies an hour.

You can get the same results. Send for bulletins and case studies on applications in the one to 75-ton pressure range. Write to: THE DENISON ENGINEERING COMPANY, 1212 Dublin Road, Columbus 16, Ohio.

DENISON
Hydraulic

You can make it yourself, like this...



or buy it from Mallory, like this...



and get a better tip for less money

"Home made" resistance welding electrodes can be expensive—not only because of the time they cost but also because of limited strength, poor conductivity and inadequate cooling.

Mallory standard stock electrodes are available in a wide range of designs. They can be adapted quickly to your special needs. Both single and double bend electrodes are cold formed, retaining maximum physical and mechanical properties...and with cooling tubes bent in place* to bring effective cooling close to the welding face. All this means long

electrode life for uninterrupted production runs.

Don't resort to makeshift arrangements for your welding applications, no matter how special they are, until you check with Mallory. Holders and electrodes are available in a wide variety of shapes and sizes... standard parts that can be combined to handle practically any job. Ask your Mallory Distributor, or write us directly, for your copy of the new Mallory Catalog. See for yourself the almost limitless combinations of standard welding items that are quickly available.

Expect more...

Get more from MALLORY

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Resistance Welding Electrodes, Holders, Dies, Rods and Bars, Castings, Forgings

*Patent No. 2489993

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Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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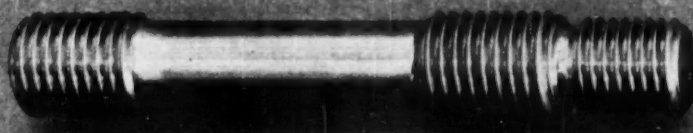


For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

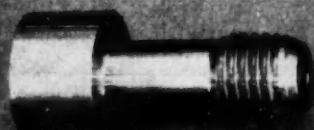
Threading that's tough...or



Threading that's fussy...



it's just another job for



Here's why so many shops
standardize on the
Namco VERS-O-TOOL system.

- One set of ground thread chasers produces more threads than 10 sets of radial hobbled and lapped chasers.
- The Namco Vers-o-tool System (with its patented Micrometer Grinding and Checking Gauge) takes the guesswork out of chaser grinding, for chasers are ground on their holding blocks so that when replaced in the head they will cut identical threads—without making trial cuts—without adjustments—without time or scrap loss.
- Standard stockable NC and NF Chasers, also National Taper Pipe and Dry Seal carried in stock.

VERS-O-TOOL

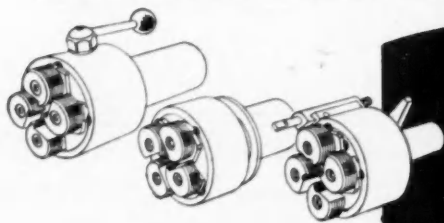


These are all Class 3 threaded parts from 347 stainless steel—special threads having rounded tops and bottoms and with 32 micro finish specified.

No every day jobs to handle, these pieces, because the work-hardening tendencies of the material under cutting pressures call for the right tools and special caution to maintain the class and finish demanded.

Plenty of shops experimented with various methods of thread chasing and grinding but it remained for Screw Products Company in Cleveland to lick the job. They are using standard Vers-o-tools for diameters to 1" with standard ground thread circular chasers and are "having no trouble at all".

Doesn't this suggest your inquiry on threading work, either tough and fussy jobs or run of mine? Catalog DT-52 will help.



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ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR
and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic
Thread Rolling Machines • Auto-
matic Threading Dies and Taps •
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Keep This View Out of Your Picture

MECHANICS Roller Bearing **UNIVERSAL JOINTS** will give your trucks more road time and less shop time because **MECHANICS JOINTS** are specially designed with less parts and connections — for easy assembly and servicing — smooth running balance — maximum strength with less weight — and long, trouble-free, safe operation.

MECHANICS JOINTS can be serviced without disturbing other attachments or altering original propeller shaft balance. Let **MECHANICS** engineers give your trucks or heavy duty machines these competitive advantages.

MECHANICS UNIVERSAL JOINT DIVISION
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Roller Bearing
UNIVERSAL
JOINTS

For Cars, Trucks, Trailers, Farm Equipment,
Road Machinery, Industrial Equipment, Aircraft



**You needn't look far
for Honeywell instrument service**

Because instruments have become such vital links in the production chain, Honeywell has developed a service organization that is the largest of its kind in the world. No matter where you may be, there's a Honeywell service man near you . . . in more than 110 service centers spotted strategically throughout the United States and Canada.

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Frequent check-ups *prevent* emergencies . . . protect your instrument investment. The economical way to do this is a Periodic Service Contract, which brings a Honeywell man to your plant at regular intervals to inspect, clean and adjust your instruments and controls. Your local Honeywell office will be glad to give you full details, and to arrange a custom-fitted contract for your requirements.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*,
Wayne and Windrim Avenues, Philadelphia 44, Pa.

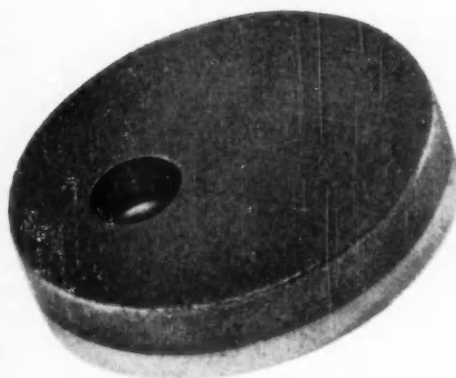
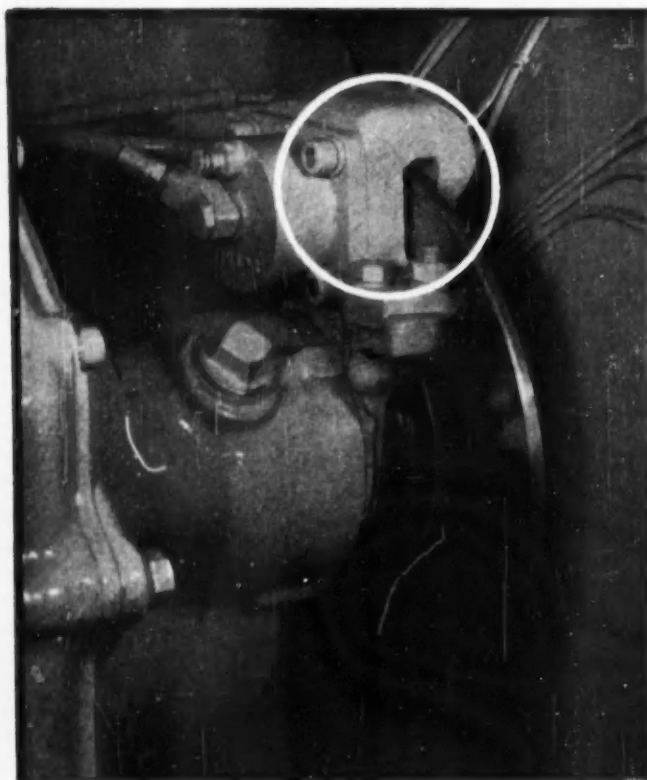


MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

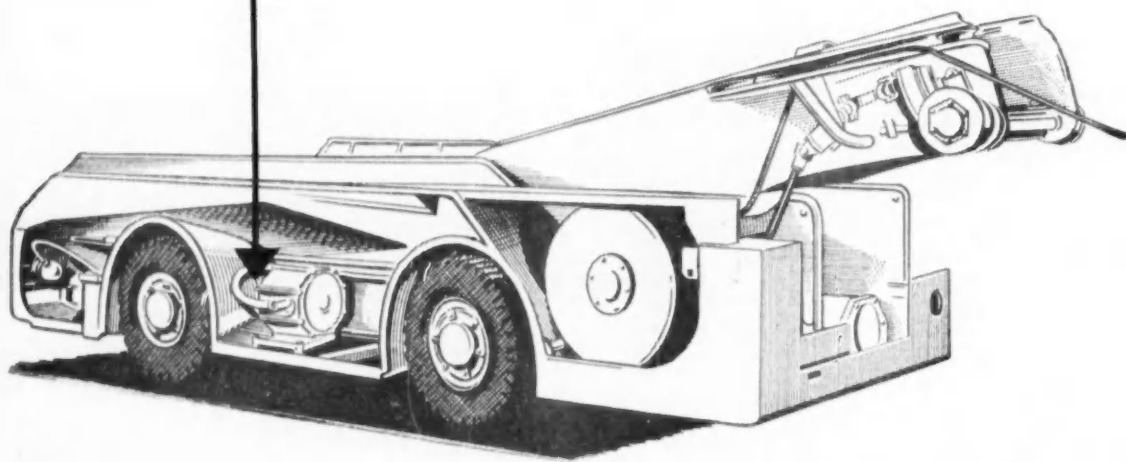
First in Controls

R/M

FAST IN FRICTION

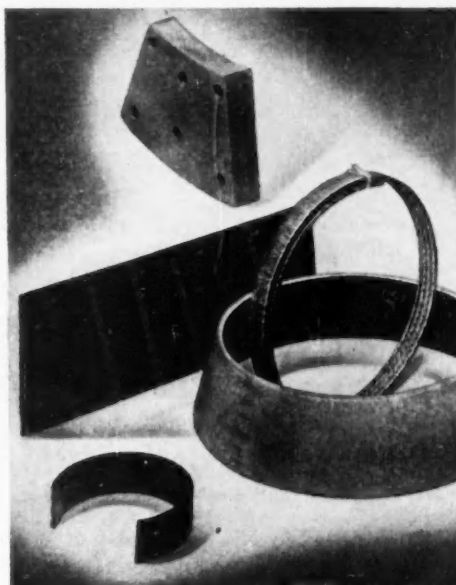


To give this cable reel shuttle-mine car reliable stopping power, R/M designed and made the sintered metal friction disc illustrated here. Two of these vitally important parts are employed on each of two disc brake assemblies. The performance they are rendering is outstanding.



THE TRADE-MARK THAT SPELLS PROGRESS IN FRICTION MATERIAL DEVELOPMENT!

The sintered metal brake part described on the opposite page typifies the hundreds of friction material products Raybestos-Manhattan has developed for specialized applications. Throughout industry in general R/M is recognized for its ability to solve tough design and manufacturing problems involving friction materials. If you have such a problem, remember that R/M has had a wealth of experience working with countless combinations of different types of friction materials . . . woven and molded asbestos, semi-metallic materials, and sintered metals . . . is constantly achieving outstanding results. Your problem could very well be one that R/M has already attacked and solved. In any case, you will find your R/M representative helpful. Call him in and get the advantage of working with a man who has the world's largest maker of friction materials behind him.



R/M's complete line of friction materials includes woven and molded asbestos parts in the form of blocks, segments, discs, cones, collars, and many special shapes.



Just off the press!—R/M Bulletin No. 500. Write for your free copy. Its 44 pages are loaded with practical design and engineering data on R/M friction materials.

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Cleveland 14

Los Angeles 58

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Manheim, Pa.

Passaic, N.J.

No. Charleston, S.C.

Crawfordsville, Ind.

Neenah, Wis.

Canadian Raybestos Co. Ltd., Peterborough, Ont.

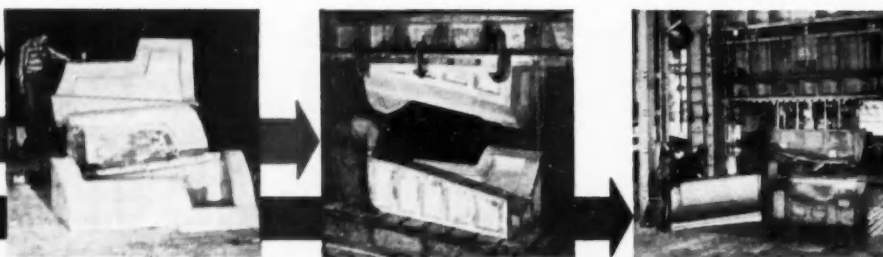
RAYBESTOS-MANHATTAN, INC., Brake Linings • Brake Blocks • Clutch Facings • Fan Belts
Radiator Hose • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Rubber Covered
Equipment • Asbestos Textiles • Packings • Abrasive and Diamond Wheels • Bowling Balls



The **PATTERN**

The **DIE**

The **STAMPING**



... to Completely Finished **PROTOTYPE PARTS** **READY FOR ASSEMBLY**

Other **Allied Products**

**SPECIAL COLD FORGED
PARTS • STANDARD CAP
SCREWS • HARDENED AND
PRECISION GROUND PARTS
• R-B INTERCHANGEABLE
PUNCHES AND DIES**

It's Allied that offers the complete service to provide you with die-made prototype parts. Plaster patterns . . . low-cost, quickly-produced dies made of plastic or zinc alloy . . . stampings accurately drawn and formed on Allied presses . . . completed parts which have been hand trimmed, flanged, pierced and spot finished . . . are all produced by Allied.

Not only is full responsibility for such a prototype program centered at one source but many economies can be effected from which you as a customer can benefit. In the building of the dies, for example, combinations of plastic, zinc alloy or steel (all of which Allied supplies) give you the best and most economical tooling for your volume requirements. In the finishing processes, as one more example, the tools themselves are often used for flanging and other purposes—additional cost-saving and accuracy-assuring operations.

If you need sheet metal stampings for prototype assemblies, you should investigate Allied's all-inclusive service. A visit to our Plant 4 in Hillsdale, Michigan will convince you that here is a positive method of insuring an economical and rapid transition from prototype to high volume production. If a visit is not convenient, let us supply you with complete information.



ALLIED PRODUCTS CORPORATION

DEPT. D-19 • 12645 BURT ROAD • DETROIT 23, MICH.



PLANT 1
Detroit, Mich.



PLANT 2
Detroit, Mich.



PLANT 3
Hillsdale, Mich.

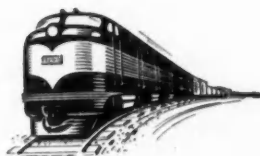


PLANT 4
Hillsdale, Mich.

Why Alloy Steels?



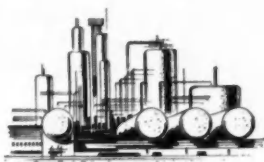
Carbon steels are better today than ever before. A major producer of both carbon and alloy steels, Republic is aware of this fact. Even so, there are limits to the application of carbon steels. Machine design may restrict the size of a part. High strength may be an essential combination with light weight. Sometimes surface hardness and ductility must be held within the limits. Such are the applications in which *only* alloy steels can perform definite tasks with certainty of results at lower ultimate cost.



Take large sections—where hardness must be carried deep into the steel. Heavy crankshafts, connecting rods, piston rods, large gear and axles are examples. Here alloy steels *are necessary*, and the cost low in proportion to results. With carbon held constant, depth-hardening quality increases as the alloy content is increased.



Sometimes weight and space limitations demand that smaller sections carry heavier loads safely. For safety's sake, the answer *must be* alloy steels. Under repeated stress, high tensile strength and hardness do not necessarily indicate high fatigue properties. The load-carrying ability of a steel depends upon its alloy constituents and the form of the structure at the time it is bearing the load.



A problem of high pressures at elevated temperatures may present a problem. But alloy steels *have proved* their high resistance to creep. Some stainless alloys maintain high strength up to 1800° F. They resist oxidation—therefore do not lose their strength appreciably through reduction of section.



High elastic properties and strength may be the primary requirement, especially for welded structures. Weight reduction may be most important. In these applications, low carbon complex alloy steels *offer distinct advantages*. Such alloy steels at equal or higher yield points show low weld-hardening tendencies. Resistance to corrosion is improved. So is ductility of the weld. And retention of toughness at sub-zero temperatures, as well as creep resistance at high temperatures, is better.



To help you get the most from alloy steels, Republic offers you its unique 3-D Metallurgical Service. You benefit from the combined experience and coordinated efforts of three groups of highly-trained men—(1) the Republic Field Metallurgists; (2) the Republic Laboratory Metallurgists; (3) the Republic Mill Metallurgists. All work hand-in-hand to help you do the job you want done with alloy steels at the lowest possible cost. Ask us about this service.

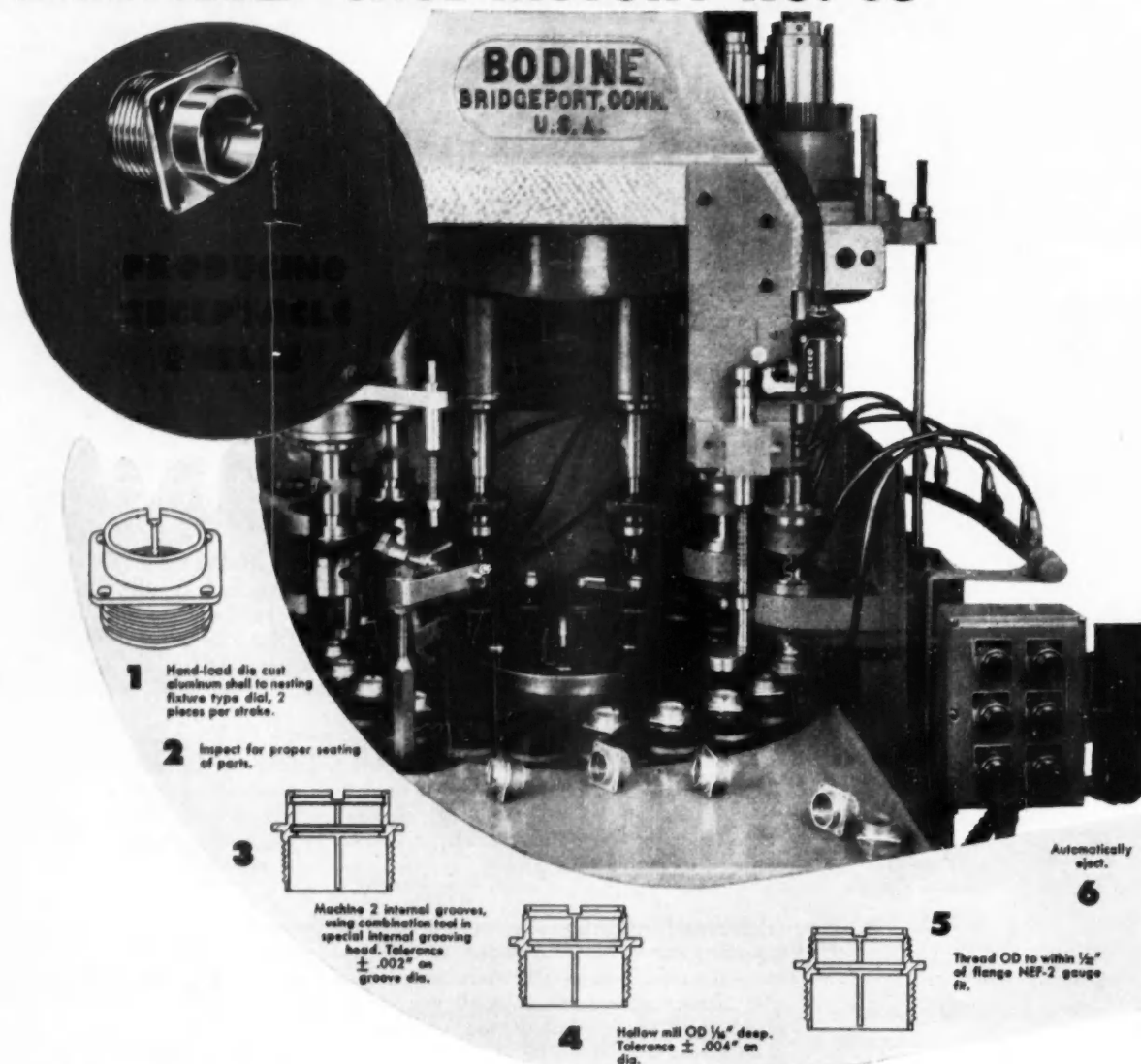
REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

REPUBLIC
ALLOY STEELS



Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Bars, Wire, Pig Iron, Steel and Plastic Pipe, Bolts and Nuts, Tubing

Bodine CASE HISTORY NO. 38



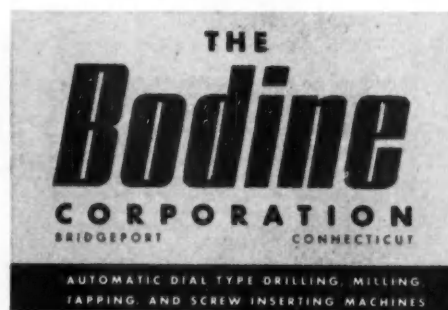
This Bodine Model 48-30 machine is tooled to handle 13 receptacle shells ranging from $\frac{7}{16}$ -27 to $1\frac{1}{8}$ -18 NEF 2 threads. Shells are used for multiple terminals in TV, Radar, etc.

PRODUCTION: From 1,600 to 2,200 pieces per 50-minute hour, depending on size of shell.

Potentiometers next to push button station regulate two electronically controlled variable speed motors. Positive, accurate control over spindle rpm and over rate of feed gives lead-screw accuracy to the threads with a non-reversing spindle.

Bodine machines (of four types) may be tooled for an extremely wide variety of high speed repetitive production jobs . . . including drilling, tapping, threading, screw inserting, light milling, and assembly. For a true picture of cost cutting, write Dept. AI-7 for our brochure "Bodine Presents 12 Typical Case Histories."

**"You Can't Meet
Tomorrow's Competition
with Yesterday's Machine Tools."**



reduce that part cost . . .

BROACH IT

the *American* way

Broaching is a metal-cutting process that will remove stock to precision limits faster than any other metal-cutting process known — and will maintain those precision limits throughout production runs.

Below are a few jobs that have been done with American broaching tools and machines.



Broach and burnish round holes in refrigerator hub parts.



Broach splines and hole in automobile bevel gear.



Broach seven external slots in pump rotor part.



Broach jig pads and bolt seats on automotive connecting rods and caps.



Broach involute teeth and cam surface of gear part.



Regardless of how simple or complex your broaching application may be, American can furnish you broaching tools to meet your requirements in part tolerance and finish.

In addition to making all types of broaching tools, American builds broaching machines and fixtures, giving you a well-rounded manufacturing service. American backs up its products with a strong service organization that makes certain broaches, fixtures and machines installed by American will do the job for you.

So why not let American help solve your machining problems. Just send a part print or sample for a free estimate.

Write for Catalog 450. It describes American broaches, machines and fixtures.



American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

AUTOMOTIVE INDUSTRIES, July 1, 1954





UNBRAKO button head socket screws are used exclusively to assemble this controlled volume pump, which was designed to fill the growing industrial need for the pumping of an allotted quantity of liquid at higher pressures, higher capacities.



The assembler inserts the UNBRAKO button head socket screw with his fingers, and runs it down as far as he can.



He then tightens it with a standard UNBRAKO key. Once seated, the low head design of the UNBRAKO button head provides a smooth, streamlined appearance.



UNBRAKO Button Head Socket Screws are made of heat treated alloy steel; have fully formed threads, Class 3 fit; are available in standard sizes from # 8 to $\frac{1}{2}$ ". Accurate hex socket provides nonslip drive, prevents marring or mutilation of the head.

Save inventory dollars

Use UNBRAKO Standards—stocked by your distributor

Not only does your UNBRAKO distributor lower inventory investment, he also saves you time—and provides latest information about products, cost-saving methods, production techniques, current problems, trade practices. For latest data on UNBRAKO standard socket screw products, consult him or write STANDARD PRESSED STEEL COMPANY, Jenkintown 53, Pennsylvania.



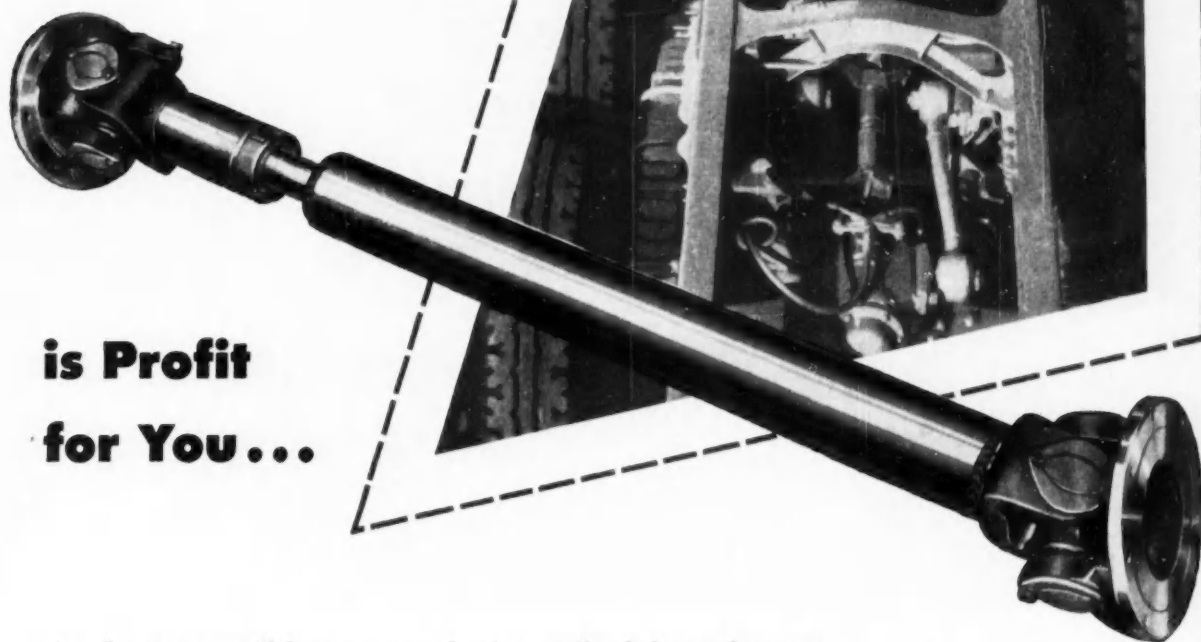
SOCKET SCREW DIVISION



JENKINTOWN PENNSYLVANIA



Quality



**is Profit
for You...**

As a fleet owner, you'd favor any step taken in propeller shaft manufacture — no matter how minute — if it prevented just one hour's down-time or one costly delay in transit.

So Blood Brothers builds to exacting standards of perfection... of *Quality*... in the vital drive lines that deliver heavy-duty truck and bus horsepower.

You can count on Blood Brothers Propeller Shafts for the ruggedness and smooth performance that add *extra* trouble-free mileage... the *extra* profit of *Quality*.



**BLOOD BROTHERS
MACHINE DIVISION**

ROCKWELL SPRING AND AXLE COMPANY
ALLEGAN, MICHIGAN

UNIVERSAL JOINTS
AND DRIVE LINE
ASSEMBLIES

Bendix power

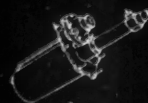
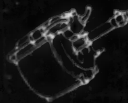
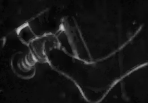
STEERING AND BRAKING

sells
more
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Today's most wanted power features for cars and trucks



Bendix* low pedal POWER brake

Specified by more car manufacturers than any other make, Bendix Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from stop-and-go controls. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety!

Bendix* POWER steering

Because Bendix Power Steering is of the linkage type, vehicle manufacturers find it especially adaptable for production line installation, without extensive engineering changes. Manufacturers can now meet the increasing demand for power steering more efficiently and more economically with Bendix Power Steering.

Bendix HYDROVAC* POWER brake

With over four million in use, the Bendix Hydrovac is by all odds the world's most widely used power brake for commercial vehicles. This overwhelming preference for Hydrovac is a result of sound engineering design, exceptional performance, low original cost and minimum service upkeep.

Bendix AIR-PAK* POWER brake

With one simple compact unit, Bendix Air-Pak combines all of the well-proven advantages of hydraulic brake actuation with an air brake system. An important advantage of Air-Pak is that brakes can be applied by foot power alone when braking is required before air pressure builds up or if it should fail for any reason.

*REG. U.S. PAT. OFF.

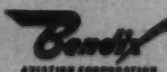
The term "Bendix Power" not only identifies the industry's outstanding power braking and power steering equipment, but describes the unmatched engineering and manufacturing resources behind these products.

It is well that Bendix Products Division be

thought of in this dual capacity, for the outstanding acceptance of Bendix power units stems largely from the fact that industry has learned over the years to look to Bendix for the latest and best in power equipment for cars, trucks and buses.

**Bendix
Products
Division**

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Export Sales: Bendix International Div.
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High Spots of This Issue

★ Production Designs Revealed at SAE Summer Meeting

Notable engineering developments in the works, some for 1955 cars and trucks, were discussed at the recent SAE Summer Meeting in Atlantic City, N. J. New automatic transmissions and gas turbines were in the limelight. Page 48.

★ Automotive Uses Emphasized at Plastics Exposition

It may be rightfully said that the vast majority of companies exhibiting at the Sixth National Plastics Exposition had an automotive product or service to offer. These and other show features are reviewed here. Page 58.

★ Automation Principles Applied to Valve Production

Confronted with the task of turning out over 300 different types of valves, Thompson Products has quite a production problem. How the company tackles the job, using various automation techniques, is described here. See Page 60.

★ Gear Tooth Fatigue Discussed at AGMA Meeting

Held last month in Hot Springs, Va., the four-day meeting of the American Gear Manufacturers was the thirty-eighth in a series of thought-provoking conferences. Extracts of some of the informative papers are presented. Page 64.

★ New Automatic Transmission Developed for British Cars

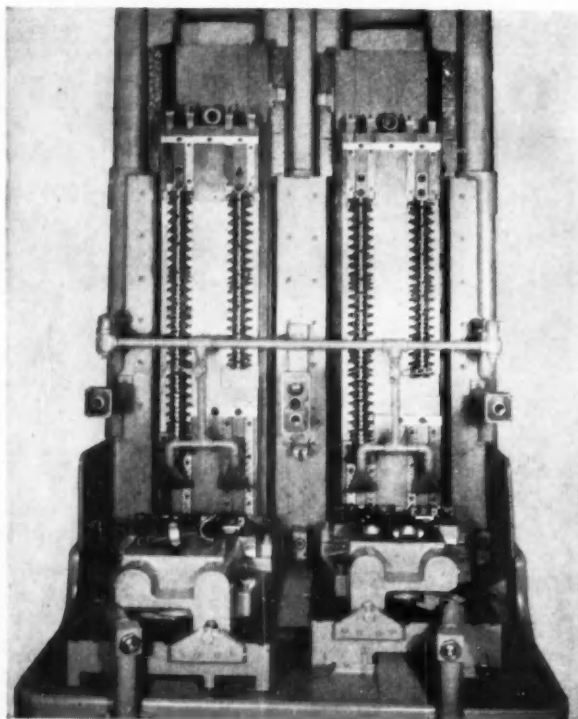
From the British Isles comes word that Hobbs Transmission, Ltd., has developed a unique transmission that may appear on some 1955 English cars. Suited for both low and medium-powered vehicles, its details are analyzed here. Page 68.

★ 33 New Product Items And Other High Spots, Such As:

Gas turbine and supersonic flight research; tubeless tires on passenger cars; semi-automatic machine hardens crankshafts; making and painting car heaters; cold rolling of splines; quality control at IHC; new automatic transmission for International trucks; and Studebaker-Packard amalgamation.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

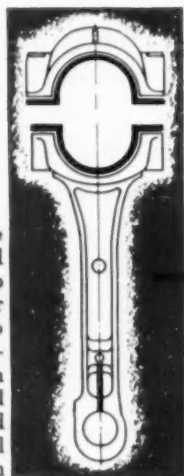


Complete Production Package by Cincinnati

**Hydro-Broaches 290 sets
of Parts per Hour**

Caps and connecting rods for automotive engines are usually required in large volume, and those broached on the equipment illustrated here are no exception. To meet the production requirements of 580 parts per hour (290 sets) Cincinnati Application Engineers tooled up a No. 10-66 Duplex Vertical Hydro-Broach with two labor-aiding mechanically actuated automatic fixtures. Each holds one pair of parts—a cap and a rod. Clamping and unclamping are automatic . . . the operator is concerned only with positioning and removing the work. ¶ Several Hydro-Broach features contribute to the uniformly high production required for work of this type. Because of the alternating cutting cycles for the rams and tables, broaching is practically continuous; ways are hardened, ground and automatically lubricated for long productive life span; pre-set cycle control safeguards the operator. ¶ Our Application Engineers will give you the benefit of their experience in recommending and tooling up new CINCINNATI machines—milling or broaching—for the lowest cost production of your work. And if you're not familiar with the new CINCINNATI Duplex Vertical Hydro-Broach Machines with receding tables, write for literature.

**THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO**



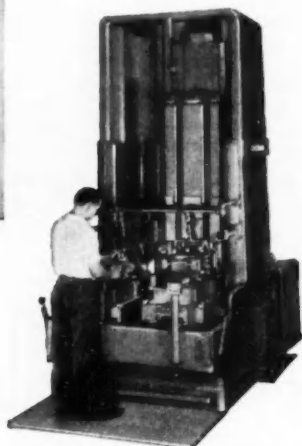
Drawing of connecting rod and cap broached on the All-Cincinnati equipment illustrated here:

Part name.....	Connecting rod and cap
Material	Steel forging
Operation	Broach half bore and parting face
Depth of cut... 1/32"	
Broaching speed..	34 feet per minute
Production	580 parts (290 sets) per hour
Machine	CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach



CINCINNATI

**MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING
MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID**



CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Write for Catalog No. M-1848 which contains complete engineering specifications.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 111, No. 1

July 1, 1954

New Hydra-Matic for 1956 Planned by General Motors

Although there have been some reports that an improved version of the Hydra-Matic transmission might make its appearance on GM's 1955 cars, it appears that it will not be used until 1956 models. Introduction of the new unit was delayed considerably by the Hydra-Matic plant fire last August.

The improved Hydra-Matic transmission reportedly will retain the planetary gear set drive. It is expected, however, to be smoother in operation with the gear sets possibly reduced in number and the step-by-step shifts less noticeable.

Ford To Expand Facilities For Engineering This Fall

Ford Motor Co. this fall will start construction on three new buildings and an annex to a present one to be used for its Engineering Staff's Research and Engineering Center in Dearborn, Mich. The program is the last phase of an \$80 million expansion plan started by the company in 1947, and it is expected to add one million sq ft of space to existing facilities.

The three new structures will include a 551,201 sq ft body engineering unit. This will consist of: offices; drafting area and experimental body shop activities; scientific laboratory and research building; and a cafeteria. The scientific laboratory and research unit will have two separate wings, which will be joined by a central library and main lobby.

In addition to the three new buildings, an annex will be linked to the Engineering Administration Bldg. It will have 24,000 sq ft of area to be used for Transmission Dept. activities. The new structures are slated for completion around 1958. Ford also plans a building for research on manufacturing methods and processes.



BIGGER OXFORD FROM BRITAIN

Recently introduced by British Motor Corp., the Morris Oxford Series II is longer and internally wider than its predecessor. It is powered by a four-cyl. ohv unit, whose bore and stroke and 90.8 cu in. displacement are the same as the M.G. Magnette engine. Compression ratio has been increased to 7.43 to 1, but, with only one carburetor, rating is 50 bhp at 4800 rpm.

Studebaker and Packard Amalgamation Will Close Era of Individual Independent Automobile Manufacturers

The last two oldest independent automobile manufacturers, Studebaker and Packard, will have disappeared as individual entities with their combination into a new corporation to be known as Studebaker-Packard Corp. It must be emphasized, however, that all plans to organize the Studebaker-Packard Corp. are subject to stockholder approval at meetings to be held August 17. Thus, in a little more than a year's time, three combinations will have replaced the six independent car companies left after World War II.

Kaiser and Willys were the first to join forces with the formation of Kaiser Motors Corp. on April 28, 1953. Nash and Hudson were combined into American Motors Corp. on May 1 of this year. The Studebaker-Packard deal was completed on June 22 after several weeks of active negotiations.

Completion of the first round of

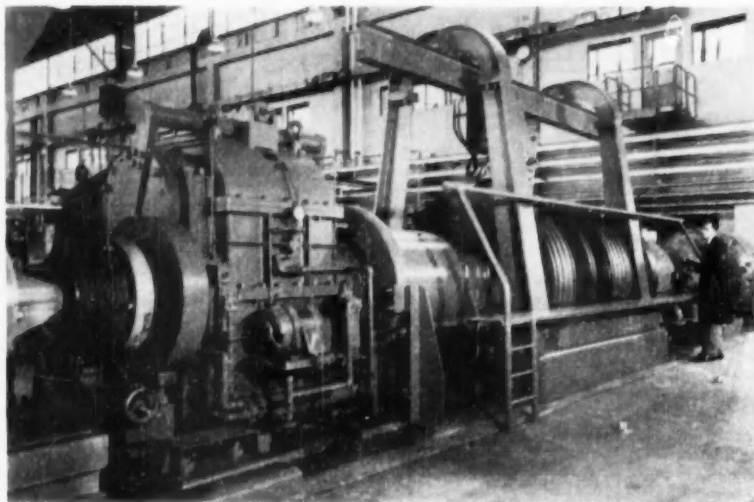
mergers among the independents supports predictions of seasoned observers in the industry who, as long as two years ago, forecast that amalgamations would result from the intense competition in a competitive market. The independents in 1953 saw their share of the industry drop to nine per cent from 13 per cent a year earlier; so far this year, they have seen it decline still further to approximately five per cent.

Financial Factors

The new corporation will have assets of \$253 million; it will thus be second in size among the independent combinations. American Motors claimed total assets of \$340 million at the time of its formation. Kaiser Motors announced its assets at the time of the merger with Willys were \$200 million.

(Turn to page 100, please)

News of the AUTOMOTIVE



MAMMOTH DYNAMOMETER TESTS BRAKE MATERIALS

Shown above is a 200-ton, inertia-type dynamometer installed in the new Friction Materials Laboratory of the Johns-Manville Research Center, Manville, N. J. The giant machine will be used for testing friction materials for aircraft, industrial equipment, railroad, truck, and bus brake assemblies. At far right are the triple-speed induction motor and clutch mechanisms. Following, in order, are inertia wheel disks, gear reduction unit, and torque stand to which brake assembly at left is attached.

Chevrolet Turning Out 50 Corvettes a Day

Starting out with a production rate of 15 units a month, Chevrolet is now turning out 50 Corvettes a day at its St. Louis, Mo., plant, the only source for the plastic body car. In May alone, the plant turned out 600 units, and present schedules call for at least 1000 Corvettes a month.

Dealers Ask Congress To Curb Car Makers

Political interest in the affairs of the automobile industry continues unabated. Rep. Crumpacker, of Ind., is continuing to push his efforts in Congress to authorize an FTC investigation of General Motors and Ford trade practices.

Considerable interest also is being shown in company-dealer relationships. Legislation to outlaw "unilateral" franchise agreements, which require dealers to accept goods not specifically ordered, has been introduced in the House. Furthermore, NADA is sponsoring legislation which

will legalize inclusion of anti-bootlegging clauses in car dealer contracts.

It is difficult at the moment to determine just how far efforts to regulate the industry in these areas will go. It is certain, though, that in an election year there will be considerable activity in that direction.

Most of the threatened legislation stems from the actions of automobile dealers and has the open or implied sanction of dealer associations. However, some dealer association officials have pointed out to their members the danger of promoting legislative regulation which may have the end result of also putting some rather severe restrictions on the dealers themselves.

Five Millionth Car Produced by Pontiac

The five millionth Pontiac car came off the assembly lines last month. The division, which turned out its first automobile in 1926, notes that about 70 per cent of the cars it manufactured are still operating on the highways of the nation.

Studebaker Workers Lose Suit Against Firm, Union

A suit filed by 19 dismissed Studebaker employees, claiming that the company and union discriminated against them because they bought a different make car rather than a Studebaker, has been ordered dropped by the National Labor Relations Board on the grounds of insufficient evidence.

The employees, seven of whom have been reinstated by the company, charged that Studebaker and a union local had a set policy of requiring employees to purchase a Studebaker. The company and union said that, although they felt there was strong loyalty toward the company among workers, there was never any such policy in existence.

\$5 Million Tax Rebate Asked by GM in Indiana

A suit filed by General Motors Corp. in Indianapolis asking a \$5 million tax refund from the state of Indiana may have significance to other companies. The suit claims that is the amount levied on products manufactured by GM in the state for the armed forces between 1951 and 1953. It is similar to one instituted recently by Bendix Aviation Corp.

However, no action was expected on the GM suit until disposition is made by the court of the Bendix litigation. Both companies contend in the bills of complaints that the products they manufactured for the Government were not an intra-state transaction and should not be taxed as such.

Kaiser's 1st Quarter Loss Estimated at \$7.5 Million

For the first quarter ended March 31, Kaiser Motors Corp. has estimated a net loss of \$7.509 million, more than double the loss it suffered in the same period a year earlier. The latest financial report brings the aggregate loss of the company since its incorporation in 1945 to almost \$86 million.

While sales were not reported for the first quarter, production of Kaiser and Willys cars totaled 5131 units. In the same period last year, the company produced 28,607 Kaiser cars.

AND AVIATION INDUSTRIES

Torture Tests and Speed Trials Color Chrysler Proving Grounds Dedication

Representing two and a half years of construction work, the new 4000-acre Chrysler Engineering Proving Grounds near Chelsea, Mich., were dedicated June 16 at impressive ceremonies attended by 600 newsmen from all parts of the nation. In addition to surveying the elaborate facilities and watching a number of vehicles put through rigorous tests, the press representatives witnessed an extensive program of special events staged for the occasion.

Endurance Road

Encircling the Proving Grounds is a gravel-surfaced contour road with grades up to 20 per cent. Running 8.4 miles in length and 25 ft wide throughout its course, it will eventually include a two-mile stretch of Belgian Block, rough brick, and bumpy asphalt paving for additional durability tests. Every car subjected to the full test cycle is driven on this tough gravel road for 10,000 miles. It is also used for tests of transmissions, brakes, steering, suspension, shock absorbers, and other components.

Six-Lane Oval Track

Another important focal point in the array of facilities at the Proving Grounds, where a single car may be subjected to as many as 200 separate tests, is the 4.7-mile long, 60-ft wide oval test track. Slope of the pavement on the banked curves, which are engineered to permit safe speeds up to 140 mph without side thrust, rises from two deg on the inside lane to 35 deg on the outside.

Along two sides of the oval track are two separate concrete straightway strips 2.2 miles and 1.6 miles in length, respectively. Altogether, the paved portions of the Proving Grounds total up to 36 miles of concrete strips 10 to 12 ft wide.

Other Facilities

Included also in the immense acreage of the Proving Grounds are: water bath, 100 ft long and 15 ft wide, for splash tests; sand pit; shake test strip and 60,000 sq ft test garage and office building. Planned for early con-

struction is a mud pit to be approximately one mile long.

Three specially designed inclines are also being developed. All will be paved and will be 24 ft wide. One is a 32 per cent grade 400 ft long, the second is a 15 per cent grade 830 ft long, while the third is a seven per cent grade 1720 ft long.

Only a few sections of specialized roads remain to be installed at the Proving Grounds. When that construction is completed in the near future, there will be 45 miles of test roads and tracks which will duplicate nearly every type of road surface and condition to be found in the world. Chrysler expects its 235 employees at the facility to log more than 2.5 million miles of driving this year in performing thousands of tests on passenger cars, trucks, and military vehicles.

Special Events of the Day

Coincident with the official dedication of its Proving Grounds, Chrysler racked up a new speed and endurance record for stock cars, demonstrated its

gas-turbine-powered automobile, and provided a special car for a new women's world speed record. It also staged a closed-track run against the clock by the top four Indianapolis Speedway race drivers which led to a new world's record.

The 24-hr speed and endurance record was set, under AAA supervision, with a strictly stock Chrysler 245-hp V-8, which completed a 24-hour continuous run shortly after the show opened. Average speed for the 2836.42 miles was 118.184 mph, including time out for 26 pit stops. The car attained speeds of more than 125 mph and averaged several laps at more than 124.1 mph during the run over the 4.7-mile track.

The women's closed track speed record was set by Miss Betty Skelton in a Dodge Firearrow sports car with a modified engine. She established a record of 143.44 mph over the high-speed course.

Highlight of the speed trials was the run against time by the four top winners of the 1954 Memorial Day (Turn page, please)



Drawing shows general layout of facilities at Chrysler Engineering Proving Grounds.

News of the AUTOMOTIVE

race. Jack McGrath set a new American closed-track speed record of 179.386 mph with his Hinkle Special, breaking the previous record of 148.17 mph.

The demonstration of the Chrysler experimental gas turbine, mounted in a Plymouth hardtop sedan, was impressive. The car maneuvered easily in front of the stands without excessive noise or heat. It appeared, however, to be somewhat slower than conventional cars in initial acceleration.

It was revealed that at a constant highway speed of 40 mph the car has averaged 14.9 miles per gal. A second gas turbine car also was on the scene, but was not demonstrated.

Steel Demand Expected To Outstrip Capacity

Demand for steel products, abundant at present, will continue to increase in the coming years and eventually outstrip capacity, one industry leader believes. Joseph L. Block, president of Inland Steel Co., bases his forecast on the steady growth in population and the rising standard of living.

Mr. Block notes that steel capacity since the end of the war has increased by 50 per cent. He feels that expansion of plants to about 124 million tons annually will not be able to keep up with the rapid population growth.



United Press

MIDGET JET BOMBER

The Douglas A4D Skyhawk, new Navy jet attack bomber, is designed to carry small atomic bombs. Powered by a Wright J-65 Sapphire engine, the plane is said to weigh less than 15,000 lb. In view of its small wing span of approximately 30 ft and length of about 40 ft, it does not have the folding wings common to carrier-based planes. The single-seater craft is designed for speeds in the neighborhood of 600 mph.

Chevrolet Opens New Warehouse in Portland

Chevrolet has completed construction of its new 105,300 sq ft warehouse and office building in Portland, Ore. The warehouse will serve as the distribution point for automobile parts to more than 400 dealers in Oregon and Washington.

Former Kaiser Workers Ask Share of Pension Fund

A bill of complaint, asking for an "equitable" split of the \$6 million pension fund of Kaiser Motors Corp. has been filed in Detroit Circuit Court by more than 250 former employees who were laid off their jobs when the company moved its operation from Willow Run. The fund was set up in 1950 and created pensions for Kaiser workers who retired when they became 65 years old.

Employees first sought cash share of the fund last December. Its board of trustees, made up of company and union members, voted against it.

It is not certain whether the former workers have any rights to the plan, since it specifically provides payments only to workers who retire when they reach 65. However, a court order filed recently restrains the trustees from altering the operation of the fund in any manner and halts payments to anyone not already receiving them.

More than 85 per cent of the workers were displaced when the Willow Run plant was taken over by General Motors Corp., and a large percentage of the employees lost their accumulated pension credits. Under present company-union agreements, pension credits are not transferable from one company to another. Outcome of the suit against Kaiser may be significant to the industry.

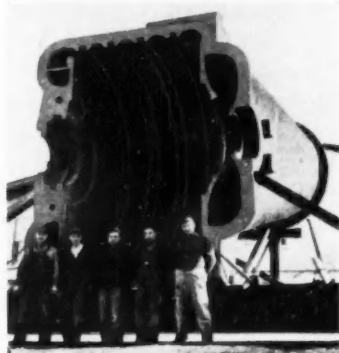


DESOTO ADVENTURER II MAKES DEBUT

Latest experimental sports coupe from DeSoto Div. of Chrysler Corp. with body styling by Ghia of Italy is the Adventurer II.

Larger than its predecessor (see *Automotive Industries*, Nov. 15, 1953, p. 23), the car measures 214 1/4 in. long and 55 1/2 in. high.

AND AVIATION INDUSTRIES



GIGANTIC CASTING

An example of precision casting by the cement-bonded sand method is this 70,000 lb. unmachined section, one of two, for what are claimed to be the largest blast furnace blowers ever built. The castings were made by the Foundry Div. of Chambersburg Engineering Co. for De Laval Steam Turbine Co. Each blower is capable of delivering 121,000 cfm of air at 35 psig discharge pressure.

Westinghouse to Build New Small Motor Plant

Westinghouse Electric Corp. has disclosed plans to expand its Small Motor Div. operation by constructing a new plant at Upper Sandusky, O. The facility will be used to produce the smaller sizes of fractional horsepower motors.

Construction of the new plant will begin as soon as possible on a 20-acre site. Production is expected to get underway some time in 1955 after the installation of special equipment is completed.

Present plans call for a one-story building with approximately 60,000 sq ft of floor space which, with machinery, would cost more than \$1 million. The structure will be designed so as to permit future expansion when required.

Continental Awarded Contract for J69

Continental Aviation & Engineering Corp. has signed a contract with the Air Force covering production tooling for the J69 gas turbine engine and manufacture of five production engines. The J69 is the powerplant of the Air Force T37 trainer.

AI TABLOID

Republic Steel Corp. has reached an agreement to purchase the property and assets of Cleveland Chain & Manufacturing Co. and its affiliates. . . I-T-E Circuit Breaker Co. has acquired Bulldog Electric Products Co.

* * *

Standard Oil Development Co. plans to produce a new base chemical for making protective coatings and plastics. Derived from butadiene, it is known as C-Oil.

* * *

General Electric Co. has formed new Outdoor Lighting and Rectifier Depts. . . American Locomotive Co. has set up an Atomic Energy Projects Dept.

* * *

Borgward has signed a contract with Argentina to set up a car plant at Buenos Aires. The German firm has also made an agreement with an Argentine automobile factory for the production of Borgward engines.

* * *

Aluminum Co. of America has consolidated its Die Castings and Castings Divs.

* * *

Allegheny Ludlow Steel Corp. has completed an expansion and improvement program at its Carmet Div. plant in Ferndale, Mich. . . Hughes Aircraft Co. has launched a major expansion of its guided missile plant at Tucson, Ariz.

* * *

Univ. of Illinois scientists report the development of two new synthetic rubbers. They are said to offer promise for heavy-duty truck and airplane tires.

* * *

Allmetal Screw Products Co. recently celebrated its 25th anniversary and the opening of its new plant at Garden City, L. I., N. Y.

Steel Improvement and Forge Co. has purchased the Champion Forge Div. of Champion Industries, Inc. . . H. K. Porter Co., Inc., has acquired Pioneer Rubber Mills, Inc. . . A. C. F. Industries, Inc., has taken over W-K-M Manufacturing Co. as a subsidiary.

* * *

International Harvester Co. is now offering right-hand drive on some models of its truck line.

* * *

Convair plans to construct a 700-ft hydrodynamic laboratory at San Diego, Calif., for further research and development of jet and turboprop seaplanes. . . Lockheed's Georgia Div. has been awarded an Air Force contract for major modification work on B-47 medium jet bombers.

* * *

Michigan Seamless Tube Co., South Lyon, Mich., is offering a 16 mm film on the production of cold drawn seamless steel tubing.

* * *

Lycoming Div. of Avco Manufacturing Corp. has reportedly been awarded an Air Force contract to develop a new gas turbine engine. Proposed power range was not disclosed.

* * *

Fleet Manufacturing, Ltd., is planning to enter the executive and industrial aircraft manufacturing and sales fields. It has reached an agreement with Helio Aircraft Corp. for these rights.

* * *

Three sound films on the operation of its Multipress are now available from Denison Engineering Co. . . Clark Equipment Co. has a new motion picture on straddle carrier operation. . . Alemite Div. of Stewart-Warner Corp. offers a film on production lubrication problems.

News of the AUTOMOTIVE

FORD, CHEVROLET HAVE 67% OF TRUCK REGISTRATIONS 1954 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1954 Four Months' Totals

MAKE	April 1954	March 1954	April 1953	FOUR MONTHS			
				Units		Per Cent of Total	
				1954	1953	1954	1953
Chevrolet	26,540	24,640	33,103	93,053	113,584	34.54	36.39
Ford	24,375	24,321	22,936	87,477	72,928	32.46	23.37
International	7,694	7,133	10,011	26,906	35,195	9.99	11.28
G. M. C.	6,654	6,303	8,465	23,721	29,762	8.80	9.54
Dodge	6,269	5,533	9,894	20,550	32,631	7.63	10.46
White	1,088	1,011	1,225	3,730	4,055	1.38	1.30
Studebaker	1,088	862	2,524	3,623	9,252	1.34	2.97
Willis Jeep	611	548	792	2,390	3,205	.89	1.03
Willis Truck	534	485	884	1,864	3,589	.69	1.15
Mack	560	486	710	1,839	2,251	.68	.72
Diamond T.	241	277	314	920	1,080	.34	.35
Reo	191	281	396	1,268	1,311	.41	.41
Autocar	114	121	168	411	551	.15	.19
Misc. Domestic	615	568	665	2,075	2,548	.77	.82
Misc. Foreign	22	14	20	69	102	.03	.03
Total—All Makes	75,504	72,583	91,127	269,452	312,021	100.00	100.00

* Based on data from R. L. Polk & Co.

UAW Waits Kaiser Decision On Proposal To Sell Cars

Filing of incorporation papers for a proposed wholesale distributorship for Kaiser and Willys cars in Toledo, O., by the UAW-CIO local has brought the union a step closer to the automobile selling business. There are, however, several problems yet to be considered. For one, the union still has to convince the management of Kaiser Motors Corp. that such a project would be feasible.

Kaiser management, while reportedly in favor of the plan, is somewhat hesitant and has not yet committed itself outright. It is giving the matter due consideration, however.

While pleased over the support the move has received from employees and local businessmen, company officials are taking a more cautious attitude. They are reported to feel that, once such a business is set up, the union and management would be perhaps too closely linked for comfort.

Another phase the company has to consider is whether the union would have the experience to sell automobiles. It is likely, though, that one or more local businessmen, who have joined in the move, would take over active management of the agency.

In order to go into the automobile selling business in Toledo, the union would have to buy out that city's pres-

ent Kaiser-Willys distributor, Laurel C. Worman, Inc. The union itself has allocated \$300,000 for the new company and hopes to capitalize it at \$1 million.

The additional capital is expected to come from the sale of 500 shares of stock at no-par value, a transaction which has been authorized by the union. Name of the new company would be Ohio Sales & Service, Inc.

Sikorsky Demonstrates Anti-Sub Helicopter

Designed specifically for combating submarines but said to have important commercial possibilities, the new Navy XHSS-1 helicopter was recently demonstrated by Sikorsky Aircraft Div. of United Aircraft Corp. Also called the S-58, the whirlybird can lower sound detecting gear into the sea to seek out enemy U-boats.

The single-engine, single-rotor craft reportedly can carry as many as a dozen passengers in addition to a crew of two. It is powered by a Wright engine with an output said to exceed 1300 hp. Bridgeport-Lycoming Div. of Avco Manufacturing Corp. is the licensed builder of the engines.

Studebaker Executive To Seek Defense Work

Studebaker Corp. has named P. O. Peterson, its executive vice-president, to head a new drive by the company to obtain more defense contracts. Studebaker has two plants ready for defense work, but it hasn't received any Government assignments since last February when it completed its contract for S-25 engines for the B-47 bombers. The company also turned out military trucks last year.

85% OF FOUR MONTHS NEW CAR SALES UNDER \$2500 1954 Retail Car Sales By Price Groups*

Number of Cars

Price Group	April				Four Months			
	1954		1953		1954		1953	
	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under \$2,000	297,493	58.80	282,690	53.81	993,565	58.72	959,104	53.70
\$2,001 to \$2,500	128,415	25.38	148,465	28.26	441,040	26.07	500,951	28.05
\$2,501 to \$3,500	59,024	11.67	72,469	13.80	183,495	10.64	250,037	14.06
Over \$3,500	21,019	4.15	21,677	4.13	73,957	4.37	75,977	4.25
Total	505,951	100.00	525,301	100.00	1,692,057	100.00	1,786,073	100.00

Dollar Volume of Sales*

Price Group	April				Four Months			
	1954		1953		1954		1953	
	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$541,974,420	50.19	\$503,999,525	45.28	\$1,809,644,645	50.24	\$1,721,061,173	45.09
\$2,001 to \$2,500	263,994,402	27.22	330,111,573	29.64	1,007,179,976	27.87	1,121,014,167	29.37
\$2,501 to \$3,500	182,143,107	19.01	198,996,862	17.87	501,266,678	13.92	686,277,537	17.94
Over \$3,500	81,829,369	7.58	90,465,862	7.23	283,323,163	7.87	288,647,173	7.56
Total	\$1,079,941,298	100.00	\$1,113,576,822	100.00	\$3,601,414,462	100.00	\$3,817,000,040	100.00

* Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

AND AVIATION INDUSTRIES

Value of Hudson Stock Is Argued In Court

Suggestions on how the stock value of dissatisfied Hudson shareholders will be appraised are being prepared by attorneys representing holders of 125,000 dissenting shares. A three-man appraisal team, required under state law in such cases, is yet to be appointed.

Under the recent merger of Hudson and Nash into American Motors Corp., Hudson shareholders were offered the option of exchanging three Hudson shares for two shares in the new corporation or of collecting \$9.80 cash for each share. The dissenting shareholders, however, argued that the amount was not "fair cash value" and have begun a court fight in Detroit. Their attorneys contend that the value of each share should have been closer to \$18 and that "net quick assets indicated that."

The attorneys further charged that the Hudson statement reported the company in sound financial condition three months prior to the merger and that the stock book value at that time was between \$37 and \$38 a share. Later, the attorneys contended, Hudson recalled its audited statement and reissued it to show that the company had suffered a big loss, causing the stock to be depressed.

CHEVROLET SEIZES REGISTRATIONS LEAD FROM FORD 1954 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1954 Four Months' Totals

MAKE	FOUR MONTHS					
	Units			Per Cent of Total		
	April 1954	March 1954	April 1953	1954	1953	1954
Chevrolet	126,255	115,070	128,376	412,858	402,929	24.29
Ford	121,475	115,607	85,273	410,284	312,880	24.14
Buick	50,359	47,972	43,465	155,302	145,669	9.14
Plymouth	37,926	34,862	53,920	135,468	189,925	7.97
Pontiac	32,560	32,126	36,549	114,633	122,707	6.75
Oldsmobile	38,643	35,037	30,278	108,285	101,549	6.37
Mercury	25,603	27,165	21,280	99,680	80,383	5.87
Dodge	14,148	13,673	30,524	50,380	96,483	2.97
Chrysler	9,794	10,179	15,090	37,477	61,477	2.21
Studebaker	8,968	8,319	16,614	32,216	47,654	1.90
Cadillac	11,169	10,545	9,770	31,342	36,411	1.84
De Soto	7,388	7,039	11,496	27,447	39,256	1.82
Nash	8,282	7,440	16,077	27,008	57,433	1.59
Packard	3,741	4,954	8,057	16,507	29,104	.97
Lincoln	3,589	3,525	4,011	12,535	11,937	.74
Hudson	2,779	2,703	7,491	10,644	23,667	.63
Willys	1,670	1,573	4,919	8,972	18,892	.35
Kaiser	1,153	814	2,731	2,915	10,222	.17
Henry J.	123	135	1,201	537	4,927	.03
Misc. Domestic	399	147	337	705	1,009	.04
Foreign	2,068	1,846	2,838	6,940	10,882	.41
Total—All Makes	506,102	460,731	526,276	1,699,123	1,797,425	100.00

* Based on data from R. L. Polk & Co.

Body Engineers Announce Program for Conversion

Technical papers on dream cars and the testing of new bodies will launch the annual three-day convention of the American Society of Body Engineers, which will open Oct. 27 in Detroit. Commercial bodies, new trends, and colors will be the subjects discussed on the second day of the con-

vention, while body materials, body die engineering, and the development of engineers will occupy the last day's program.

Leading supplier of automotive body parts will display their latest products at the convention. Most of the exhibit space has already been engaged.



METAL MELTER

High-speed friction band saw is required to cut off sprues and risers from castings at the new investment casting plant of Howard Foundry Co. In effect, saw bites its way through hard-to-machine steel alloys, which are cast principally in the "lost wax" process. Before and after cut-off of sprues, parts are cleaned of investment sand by first using Wheelabrator and then sand blasting.

Timken Spending \$3.5 Million On Bucyrus Plant Expansion

Timken Roller Bearing Co. has revealed plans to install six new furnaces and auxiliary equipment in its Bucyrus plant. The new Surface Combustion furnaces will process bearing parts coming from five bearing cone production lines.

Already on order and scheduled for installation by Dec. 1, are 16 automatic screw machines. These will also be a part of the new cone production line.

A total of over \$3.5 million has been spent, and will be spent, within the next six months on Timken's expansion program at its Bucyrus plant.

Continued on Page 98

Men in the News



Stewart-Warner Corp.—Bennett Archambault was elected president and a director of the company.



Westinghouse Electric Corp.—Donald C. Burnham has joined the firm as vice-president in charge of manufacturing.



Budd Co.—Edward W. Jackson has been appointed works manager of the Charlevoix plant in Detroit.

General Motors Corp.—Roger M. Kyes has rejoined the firm as vice-president, director, member of the Operations Policy Committee, and group executive in charge of the GMC Truck & Coach Div. and the Dayton and Household Appliance Div. Ivan L. Wiles and Thomas H. Keating have been elected to the board of directors.

Carborundum Co.—Semon H. Stupakoff was elected vice-president.

Seiberling Rubber Co., Plastics Div.—Robert S. Price has been appointed general manager.

Chrysler Corp., Comptroller's Div.—James H. Birnie was named chief accountant, Everett G. Bliss, manager of the Price Study Dept., A. Newton Cole, manager of the Tax Dept., and W. L. Dewey, coordinator of defense accounting.

Caterpillar Tractor Co.—William Blackie was elected executive vice-president.

New Process Gear Corp.—David H. Brown has become director of engineering and research.

American Machine & Foundry Co.—Robert W. Kerr has been named a divisional vice-president and group executive of the General Products Group.

Stewart-Warner Corp., Alemite Div.—Thomas M. Murphy has been appointed manager of industrial sales.

American Steel & Wire Div., U. S. Steel Corp.—Harold Christopher and Adolph A. Hirstius have been made manager and assistant manager, respectively, of the Manufacturers Products Dept.

U. S. Axle Co., Inc.—Lawrence E. Orgill has been elected president and general manager. Elizabeth Watson succeeds him as treasurer.

White Motor Co., Lease Sales Div.—Max L. Strausser is now manager.

Borg-Warner Corp., Rockford Clutch Div.—R. A. Carlson has been appointed vice-president and manager of engineering. E. R. Williams has been promoted to sales manager, and F. C. Fager succeeds him as assistant sales manager.

Republic Aviation Corp.—Kenneth F. Leaman has been chosen assistant to the vice-president and general manager.

American Bosch Corp.—William A. Damerel has been named works manager of the main plant at Springfield, Mass.

AP Parts Corp.—H. C. Stivers is now assistant sales manager.

Pratt & Whitney Div., Niles-Bement-Pond Co.—Stanley W. Lovejoy has been named manager of cutting tool research.



Twin Coach Co., Aviation Div.—Stuart N. Smith has been appointed works manager of the Buffalo plant.

Republic Aviation Corp.—Walter G. Bain has been appointed vice-president and general manager.

Industrial Sound Control, Inc.—Robert E. DePatie is now production and procurement manager.

Bendix Products Div., Bendix Aviation Corp.—Richard E. Whiffen was promoted to manager of quality control, and T. S. Torian was advanced to manager of planning, costing, and scheduling in the Missile Section. Additions to the staff include Donald G. Speyer, attorney, and Richard F. Hamaker, chief administrative engineer.

Studebaker Corp.—Earl M. Douglas has been placed in charge of all manufacturing operations.

Hudson Motor Car Div., American Motors Corp.—Arnold A. Behling has been appointed comptroller.

Chrysler Corp.—Charles L. Jacobson has been placed in charge of sales activities for the firm, while A. vanderZee has been assigned to concentrate in an executive capacity on the Forward Development Program.

Ford Motor Co.—H. E. Alspach is now general auditor.

Pratt & Whitney Div., Niles-Bement-Pond Co.—Jacob J. Jaeger has been appointed chief engineer of the Machinery Engineering Dept.

McKay Machine Co.—Ambrose J. Wardle, Jr., has been made vice-president in charge of sales; Carl J. Honen, vice-president in charge of advertising and sales promotion; and R. J. Miller, vice-chairman and first vice-president.

Fairbanks, Morse & Co.—R. H. Morse III is now assistant to the vice-president in charge of sales, and W. E. Watson has been chosen manager of the Beloit, Wis., works.

General Electric Co.—Ernest E. George has been named manager of magnetic products engineering in the Carboly Dept.

Chrysler Corp.—Albert H. Green, L. Sidney Oehring, and Dennis A. Buckley have been named investment managers in the new Dealer Enterprise Program.

Air Reduction Canada, Ltd.—S. H. Newburn was appointed president.

International Nickel Co., Inc.—Frank L. LaQue has been elected vice-president and manager of the Development and Research Div. O. B. J. Fraser and Donald J. Reese will serve as assistant managers of the division.



Electric Auto - Life Co.—James P. Falvey has been elected president of the firm.



Snyder Tool & Engineering Co.—William C. Goeckel has been chosen sales manager.



Continental Motors Corp.—Lt. Gen. Doyle O. Hickey (Ret.) has been appointed executive vice-president of the firm and manager of the New Products Div.

American Machine & Foundry Co.—**Edward H. Weitzen** has joined the firm as vice-president in charge of marketing.

McCulloch Motors Corp.—**Joseph Merlo** has been named advertising manager, and **Charles D. Allis** is now assistant general sales manager.

Birdsboro Steel Foundry & Machine Co.—**Marshall Post** has retired as vice-president in charge of operations.

Clevite-Brush Development Co.—**Frank Fraser** has been named administrative vice-president.

Ford Motor Co.—**Earl H. Frey** was made distribution coordinator at the Buffalo, N.Y., assembly plant, and **Guy Sturdevant, Jr.**, was promoted to manager of the Distribution Dept.

Carbide & Carbon Chemicals Co.—**Robert N. Graham** and **William F. Reich, Jr.**, have been appointed executive vice-presidents, and **N. C. Babcock, E. E. Fogle**, and **H. D. Kinsey** have been made vice-presidents.

Allen Electric & Equipment Co.—**Leonard O. Zick** was named president.

R. M. Hollingshead Corp.—**Reid W. Malcolm, Jr.**, has been appointed director of research and development.

Babcock & Wilcox Co., Boiler Div.—**J. R. Connell** has been made assistant general purchasing agent.

General Electric Co.—**Edgar W. Engle** has been named manager of cemented carbide products engineering in the Carbology Dept.

Minnesota Mining & Mfg. Co., Coated Abrasives and Related Products Div.—**Clare W. Goodsell** has been promoted to automotive trades manager.

E. W. Bliss Co., Rolling Mill Div.—**Arthur W. Johnson** has joined the engineering staff.

Goodyear Tire & Rubber Co., Metal Products Div.—**Joseph F. Hutchinson** was chosen assistant general manager.

Garrett Supply Co.—**Frank W. Nelson** has been named manager.

Northrop Aircraft, Inc.—**Robert R. Miller** has been chosen assistant to the president.

Servomechanisms, Inc., Components Div.—**John R. Crawford** is now sales manager.

Westinghouse Electric Corp., Aviation Gas Turbine Div.—**Joseph F. Chalupa** has been appointed assistant works manager.

Magnesium Co. of America—**Nelan E. McDonald** has been named to head the new Impact Extrusion Dept.

General Electric Co., Construction Materials Div.—**Howard M. McNeil** is now wire and cable specialist.

National Vulcanized Fibre Co.—**William H. Brown** has been chosen to head the new Advertising-Promotion Dept.

Bendix Aviation Corp., Montrose Div.—**Malcolm O. Douglas** has been made manager of the Sales Dept.



Aluminum Co. of America—William C. Woodward was made manager of forging sales.

Vickers, Inc.—**Gregory M. McKeown** was named head of the Product Service Dept., succeeding **P. H. Emrich**, who has become manager of the Joplin plant.

Douglas Aircraft Co., Inc.—**B. W. Clawson** has been chosen manager of the Tucson facility.

Ford Motor Co.—**John W. Schneider** has been appointed manager of the Dearborn Iron Foundry, while **Harold C. Grant** has become manager of the Dearborn Specialty Foundry.

Air Reduction Sales Co.—**J. H. Humberstone** succeeds **H. R. Salisbury** as president.

Aluminum Co. of America, Castings Div.—**A. B. Norton** has been named director of die casting operations, and **H. C. Erskine** has become assistant general manager of the division.

Willys Motors, Inc.—**Raymond R. Rausch** has resigned as executive vice-president and a director.

Spencer Mfg. Co.—**H. A. Warburton, Jr.**, has been appointed executive vice-president. **D. F. Patterson** has become assistant sales manager; **H. F. Rolf**, sales manager of the Replacement Parts Div.; **J. H. Gulick**, plant manager; and **A. N. Booth**, comptroller.

Gould-National Batteries, Inc., Dallas Div.—**C. E. Mathews** is now manager.

Wyckoff Steel Co.—**Edward C. Koester** has become district manager of the new Detroit office.

Goodyear Tire & Rubber Co.—**E. C. Sauter** was made manager of cycle tire sales, replacing **M. F. Moyer**, now assistant manager of the Auto Tire Sales Dept.

Minnesota Mining & Mfg. Co., Adhesives & Coatings Div.—**John P. Albade** has been promoted to western area industrial sales manager.

Necrology

George T. Christopher, 66, former president and general manager of Packard Motor Car Co., died June 7, at Tipp City, O.

C. Dudley Armstrong, 65, director and former vice-president and secretary of Armstrong Cork Co., died June 8, at Haverford, Pa.

Gilbert J. Scofield, 68, automotive parts inventor and chief engineer on the Marmon car, died June 2, at Lake Placid, N. Y.

Theodore M. Hiester, 77, organizer of United Aircraft Products Co. and National Steel Products Co. and one-time president of the former, died May 27, at Buffalo, N. Y.

Herbert A. Bernreuter, 53, vice-president and general manager of Simpson Electric Co., died recently, at Elmwood Park, Ill.

Here, too, GEAR

BOEING

DOUGLAS

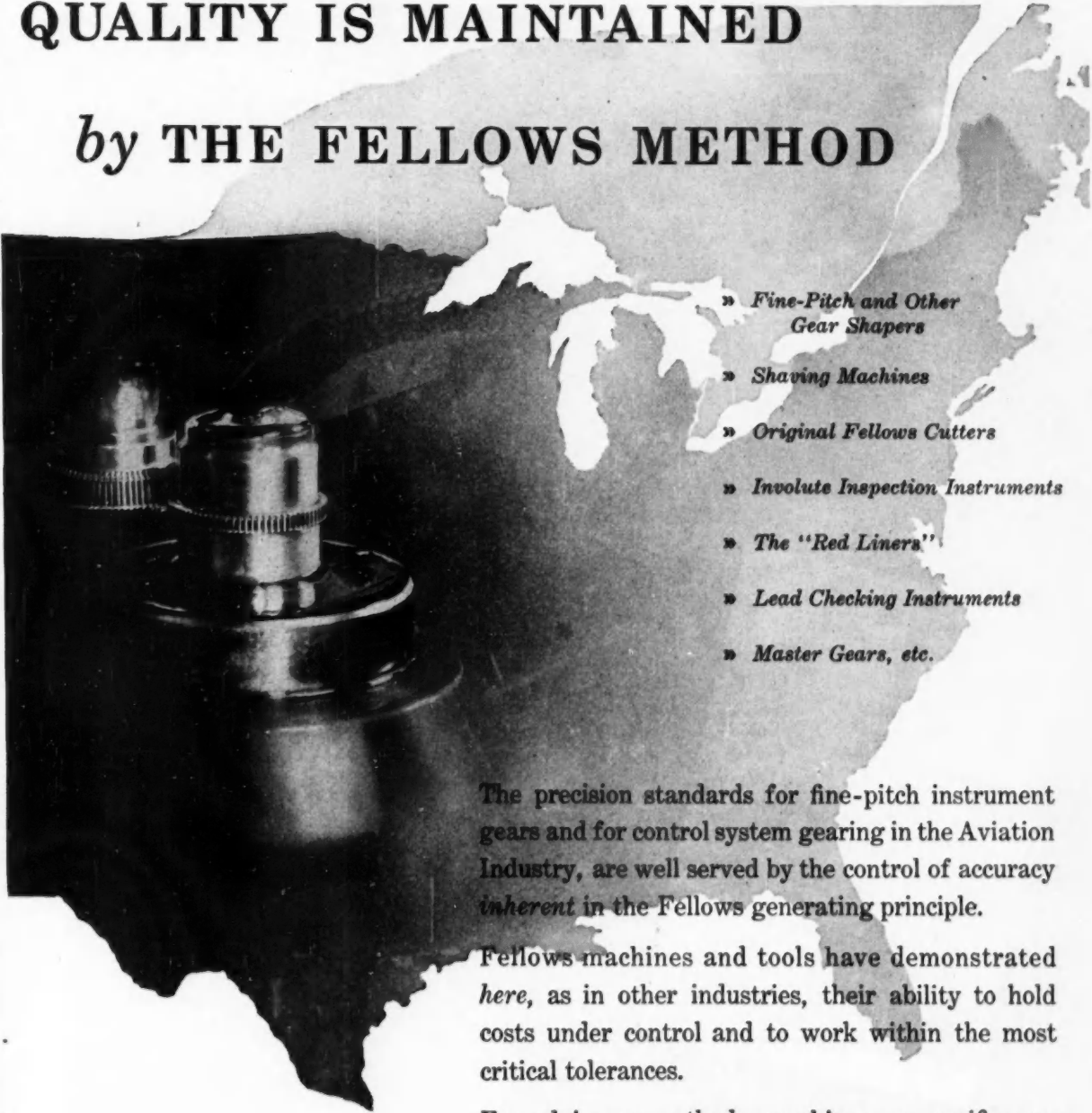


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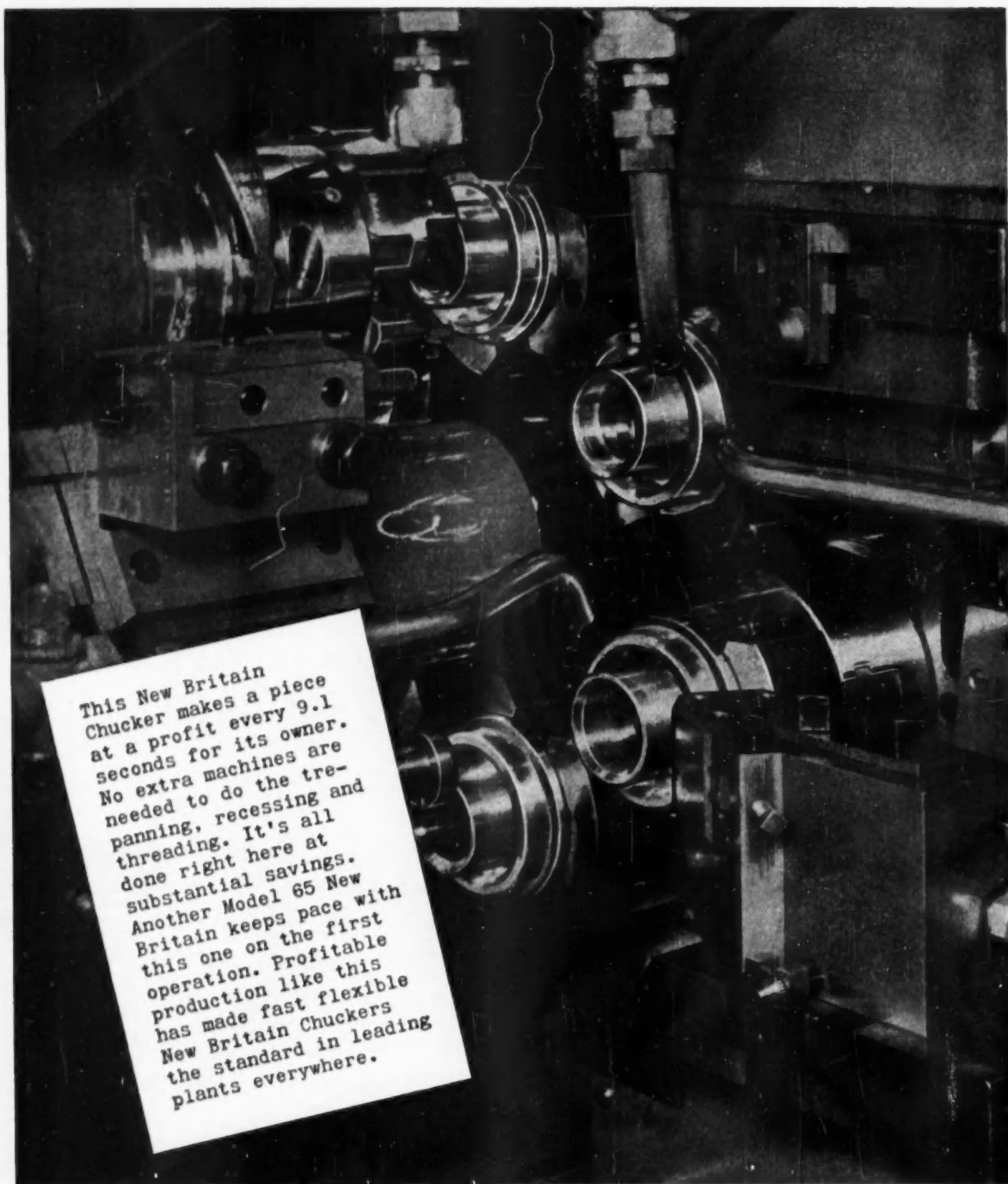
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Fellows machines and tools have demonstrated *here*, as in other industries, their ability to hold costs under control and to work within the most critical tolerances.

For advice on methods, machines, or specific production problems, call on the nearest Fellows office.

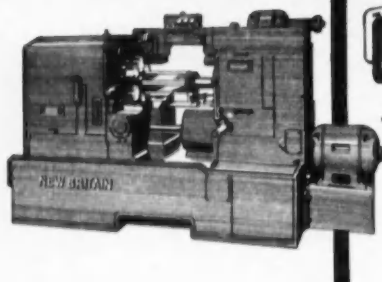
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This New Britain Chucker makes a piece at a profit every 9.1 seconds for its owner. No extra machines are needed to do the trepanning, recessing and threading. It's all done right here at substantial savings. Another Model 65 New Britain keeps pace with this one on the first operation. Profitable production like this has made fast flexible New Britain Chuckers the standard in leading plants everywhere.

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... Machines for Making Progress

Automatic Bar and Chucking Machines

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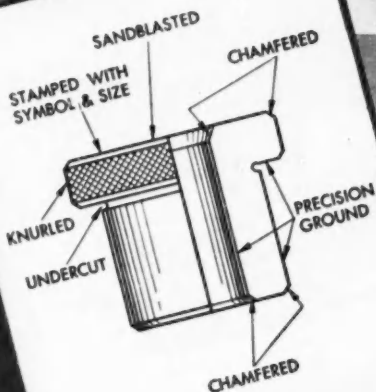
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in Drill Bushings

EX-CELL-O
HAS THEM ALL

- ✓ **MATERIAL**—High chrome and carbon oil-hardening steel for maximum wear.
- ✓ **FINISH**—precision ground inside and out, and under the head for perfect bearing.
- ✓ **CONCENTRICITY**—assured by grinding on arbors after the holes are finished.
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A	AVAILABILITY
S	SERVICE
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AVAILABILITY of **B & W** CARBON STEEL

SEAMLESS MECHANICAL TUBING

Gives you buying convenience

1. You can specify hot-finished, cold-drawn or roto-rocked tubing.

2. You can select tube sizes in diameters up to 9" OD in a complete range of wall thicknesses.

3. You can choose from regular carbon steels, free-machining steels such as C1117, C1126, C1137, or high manganese steels like C1019, C1022 and C1024.

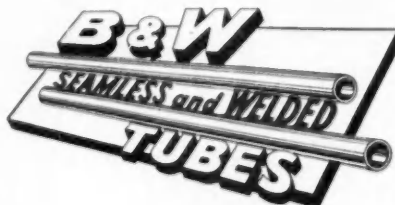
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TA-4049 (CSM)

Bendix ^{automotive} Electric Fuel Pump

Prevents Vapor Lock



- Result*
- better performance
 - better gas mileage
 - reduced service expense

Today it's more important than ever that car and truck manufacturers take every precaution to prevent vapor lock in their vehicles. Modern design and more volatile gasoline contribute immeasurably to increased power and speed; but in achieving these desirable goals heat problems are sometimes increased to the point where vapor lock occurs. Then, gas mileage is reduced, gains in power and speed are nullified, and worst of all, if vapor lock occurs frequently, exhaust valves burn out and expensive overhauls are necessary.

Fortunately car and truck manufacturers can now guard against this hazard. By installing Bendix* Electric Fuel Pumps, vapor lock can positively be prevented and the efficient performance built into the vehicle will be delivered under every operating condition.

In today's competitive market, here is small investment that will pay big dividends in increased customer satisfaction. Descriptive folder available on request.

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Check these Features

- Prevents vapor lock.
- Built-in pressure release—no flooding.
- Instant hot weather re-starts.
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Major New Designs Ready for Production

Technical Sessions at SAE Summer Meeting
Devoted to Current Automotive and Aviation Projects

By James R. Custer

BIG engineering developments are underway throughout the automobile industry, many of them being readied for 1955 car and truck models, it was indicated at the summer meeting of the Society of Automotive Engineers held early last month at Atlantic City, N. J. In attendance were approximately 1200 members and guests, about the same number as in 1953.

There are several new automatic transmissions being planned for 1955 and 1956, and important improvements in others. International has just announced its automatic transmission for light trucks and a description of it is given elsewhere in this issue. At least a half dozen new V-8 engines will be introduced. In addition, new bodies are due for some car models. With production of power steering units increasing rapidly, further price reductions of substantial amounts can be expected, this writer was told.

Automotive gas turbines were the subject of much discussion. Optimism is growing for their eventual adoption in land vehicles, particularly for powering heavy duty trucks, buses and earthmoving equipment. Their use in passenger cars is farther in the future, it was generally agreed. Major problems confronting engineers for their practical application are improved fuel economy, faster vehicle acceleration and an adequate braking system to offset the lack of engine braking during deceleration.

Gas Turbine Symposium

One session was devoted to a turbine-driven vehicle symposium featuring papers by three General Motors engineers on the Firebird and Turbo-Cruiser bus, each powered by an experimental gas turbine. R. F. McLean of the Styling Section described the Firebird plastic body, Robert Schilling of the Research Laboratories Division its chassis design, and W. A. Turunen of the Research Laboratories presented a progress

report on automotive gas turbine development and analyzed the Firebird and Turbo-Cruiser installations. An abstract of the paper is included with this article.

Another important paper on a gas turbine application was given by R. P. Alex of the Sikorsky Aircraft Division, United Aircraft Corp. He compared helicopter flight experience with piston engines and gas turbine engines. Excellent performance characteristics were reported for a Continental XT-51 fixed shaft gas turbine installation in a S-59 Sikorsky helicopter. According to information available the Air Force will announce soon the production of this gas turbine engined helicopter.

Considerable interest was shown in the Napier Nomad aircraft engine, a compound Diesel-gas turbine powerplant, which was described by Herbert Sammons, managing director, and Ernest Chatterton, chief engineer of the piston engine division, D. Napier & Sons Ltd., England. With water injection this engine is rated at 3970 hp at takeoff and has a minimum specific fuel consumption of 0.34 lb per shp, sea level at 60 per cent takeoff power. The complete engine was described in the June 15 issue of *AUTOMOTIVE INDUSTRIES*.

Possibilities of automatic transmissions for heavy duty motor trucks were fully explored by D. T. Sickelsteel, Borg-Warner Corp. His paper dealt primarily with an analysis of existing passenger car automatic transmissions as well as conventional and special transmissions now used in trucks. Later discussion developed the fact that considerable development work is going on behind the scenes. It is interesting to contemplate that before long we may see some automatic drives of planetary gear type design to meet the needs of heavy duty operations.

At a symposium on new developments in crankcase oils, petroleum company technologists discussed the new multigrade crankcase oils, 5W-20 and 10W-30, and their performance in service. Data were produced to show they reduce fuel and oil consumption in addition to functioning better in a wide range of temperature and viscosity conditions. Another paper

described an oil containing special additives that is claimed to prevent hydraulic valve lifter sticking.

Several methods were presented at the preignition symposium for determining and analyzing the relation of preignition and combustion chamber deposits. Outstanding papers were given by engineers from duPont, Ethyl, Socony-Vacuum, Shell, General Motors, Standard Oil Development, and California Research companies.

Roundtable and panel sessions again proved popular. Automobile air conditioning systems of the front end type, package type and trunk compartment evaporator type were analyzed. Subjects of other meetings included car heating and ventilating, new developments in non-metallic materials, noise suppression in passenger cars, manufacturing cost reduction techniques, non-destructive testing methods, combustion chambers of Diesel engines, problems of compressor bleed for aircraft cabin pressurization, and instrumentation methods for aircraft jet engine testing.

An outstanding group of Diesel engine experts met to discuss combustion chambers of automotive Diesel engines. It was no surprise to find that no new conclusions were reached, nor did anyone come up with a fresh concept of combustion chamber design. On the other hand, a frank approach by everyone concerned did much to advance thinking on the subject.

It was obvious that the last word on Diesel combustion chambers has not been said. It was agreed that much work has to be done in exploring the ramifications of the subject. Even some of the major phenomena such as the role of "swirl" and "squish" still are not completely understood. It was also clear there is no ideal type of chamber. Each designer must effect his own compromise, accept certain advantages and limitations.

One gained the impression, moreover, that further advances to meet the competition of modern gasoline engines should be in the direction of supercharging. Here again it was obvious that supercharging must be improved if all of the potential gains are to be realized.

Dickson of Detroit Diesel presented an analysis of 144 current Diesel engines, showed that 88 of these employed open or direct chambers, while 56 featured some form of energy cell. If any dramatic advance is to be realized some one would have to come up with an entirely different arrangement, if that is feasible.

C. L. Hecker, The Oliver Corp., can be credited with an ingeniously contrived round table for production men. It was actually a skit presenting the management group of a rapidly sinking truck manufacturer. Their objective was to analyze the status of the business and decide what to do to put it back on its feet. The budget director analyzed the statement of the company, indicated what had to be done from a financial standpoint. Discussion then leaped from one executive to another often leading to dispute and debate.

The chief engineer started the ball rolling by indi-

cating a few examples of cost reduction through engineering redesign part by part. This carried the picture directly into materials, production methods, and machinery. Then came the question of direct labor savings. It was agreed that workers would have to be reassigned so as to perform more than one operation, by tending two or more machines. Discussion also led to a consideration of what was being bought from suppliers and what might be placed in their own plant in the interest of utilizing direct labor more effectively.

Machine tools were considered and how much equipment was obsolete, incapable of doing the job properly. How much money could be preempted for the purchase of new equipment was decided. So the discussion ranged and raged around the table. It covered the gamut of management problems—of equal importance whether the plant is large or small. Finally it was agreed that the group would go back to work and organize teams to study the entire vehicle part by part—design changes, materials, methods, and new equipment where practical.

New Materials

Price of trim materials, which fell from $1\frac{1}{2}$ to $\frac{1}{2}$ per cent of the cost of the passenger car from 1940 to 1954, is not likely to fall further, according to R. B. Blodgett of Robbins Mills. Nylon is the king of fabrics and is likely to continue, with Orlon and Dacron for the brighter shades. Dacron is still too costly for universal use, he added. Speaking of style trends, Blodgett said there may well be a swing away from the bright shades and lusters, with more patterns of the Jacquard type.

Elastomeric cellular materials—foam rubbers—are being made by new methods which will allow new applications, said T. H. Rogers of Goodyear.

Thermosetting cements are being tested by several firms in assembly of sheet metal — including door panels and deck lids, C. Lipe of Chrysler-Cycleweld reported. Body sealers of the asphalt-elastomer-resin filler type will find wider use in filling spot-welded seams, cavities, and around fixed glass where extruded sealers are now used.

Sound absorbing and sound blocking are equally important in a deadener, J. G. Haviland of Fisher Body told the group. Their tests showed that dense materials are best, as long as they do not become a sounding board, he explained.

Vinyl plastic materials in passenger cars will go as high as 15 lb per car in the future, stated N. J. Rakas of National Automotive Fibers, especially with further use of the unsupported type. Synthetic carpeting will grow, he said, when rayon is treated with a resin finish to repel water and solve the dirt problem. NAF is working on a head lining using a low-priced cotton weave impregnated with resin and embossed to hide weaving sins, he added.

Extracts from a few of the outstanding papers are presented here on the following pages.

Helicopter Flight Experience with the Continental XT-51 Fixed Shaft Turbine

By Ralph P. Alex
Sikorsky Aircraft Div.
UNITED AIRCRAFT CORP.

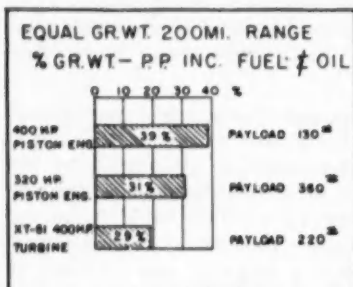


FIG. 1

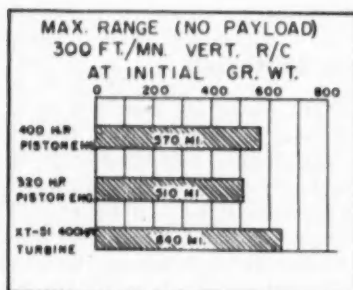


FIG. 2

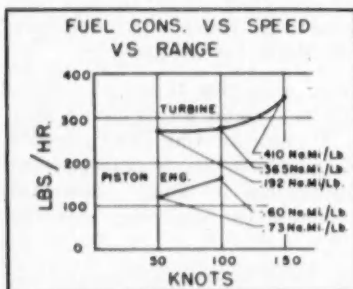


FIG. 3

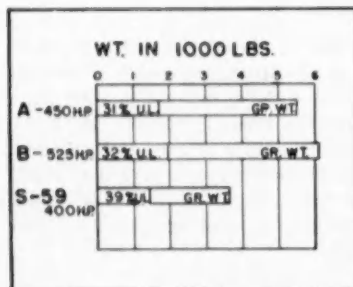


FIG. 4

IN Fig. 1 is shown a comparison of the new S-59 helicopter using a currently available 400 hp piston engine, a 320 hp piston engine, and the Continental Aviation and Engineering Corp. XT-51 400 hp turbine. At equal gross weight, equal range, the turbine installation has a substantial advantage in percentage of gross weight for the power plant installation including fuel and oil for a fixed range. While the payload at equal gross weight of the 320 hp piston engine seems more attractive, it should be realized that with this engine at this gross weight, the performance is at the minimum acceptable for operational use. The turbine installation would have an 80 hp advantage that could be used to both increase performance and increase payload substantially before the minimum performance value was reached. It is also quite evident from this chart, that for very short range missions, the turbine would have a substantial payload advantage over the piston engine of equal power. In its graphical presentation it should also be taken into account that the piston engine hp would not be 400 but would be 400 hp less the required engine self-cooling power, thereby making it even less desirable.

Fig. 2 gives a comparison of the same three engines, this time depicting the maximum range without payload at an equal minimum vertical rate of climb. Again the turbine engine is superior.

In a comparison of fuel consumption vs.-speed, vs.-range as shown by Fig. 3, it is quite apparent that the gas turbine engine increases its range with equal fuel quite considerably at the highest possible cruising speed. This is not true of the piston engine as shown on this chart. The conclusion reached by this analysis clearly establishes that a turbine-powered helicopter requires the maximum increase of performance to provide reasonable range at a reasonable fuel consumption. An increase of speed from 100 to 150 knots provides for a fuel consumption increase of 11 to 12 per cent and a speed increase of 50 per cent.

Useful Load vs. Gross Weight

Fig. 4 shows two different helicopter production types in comparison with the S-59. In the first type "A" which depicts a helicopter of 5500 lb gross weight, the useful load

is 31 per cent of this total. Helicopter "B" which is a later development type, now in service, grosses 6100 lb and has a 32 per cent useful load complement. The turbine-powered S-59 with a substantially lower gross weight has a useful load of 39 per cent. As can be seen from this figure, the actual useful load is in the same league. This is accomplished with a helicopter which has about a 2000 lb gross weight reduction. This decrease of gross weight, by approximately 1/3, shows a substantial improvement due to the availability of suitable power plants. It should also be mentioned that this particular model helicopter has had a background of eight years of development which complements the improved power plant and collectively results in a helicopter with substantial design advances.

Fixed Shaft vs. Free Shaft Turbine

1. The XT-51 fixed shaft turbine has shown excellent compatibility with the rotor system in this aircraft. The simple isochronous governor control has provided an adequate constant speed device.

2. The free shaft turbine has no apparent advantage when it is not desired to make use of take-off power in normal operation.

3. The use of the free turbine could possibly allow for the elimination of the clutch, although a free wheeling device would be necessary. (It is the writer's opinion that a clutch would still be very desirable to allow operation with the rotor disengaged to eliminate the dangers of rotor brake malfunctioning during starting and also to reduce the starter load which would be increased if no clutch were employed.)

In order to maintain constant speed with the free turbine, a balanced governor system would be required to control both the gas generator and output turbine wheels, and an additional topping governor would also be required to prevent overspeed of the gas generator. A possible disadvantage would also be the low rotational inertia of the output turbine section which would greatly increase the severity of providing a constant speed rotor.

Disadvantages of Gas Turbine Use

1. High fuel consumption at all operating conditions, including operational idle, makes it mandatory that flight schedules must be completed in the shortest possible time.

2. Hot weather operation seriously reduces power (approximately 1/2 per cent power loss per one degree

Fahrenheit temperature rise over a 60 F standard day). This feature will possibly require a proportional reduction in payload per increment of temperature increase over standard day conditions.

3. Operation at takeoff power will require extreme care so that maximum tail pipe temperature will not be exceeded, otherwise severe damage to the engine may result, and rapid failure.

Pinwheels or Pistons? A Progress Report on Automotive Gas Turbines

By W. A. Turunen

Research Laboratories Div.
GENERAL MOTORS CORP.

BEFORE the GT-300 engine could be installed and tested in a vehicle, another version of this engine was built. The new model, designated the GT-302, is shown schematically in Fig. 1. The design objective of this engine, to be installed in the XP-21 Firebird, was to utilize all the major components of the GT-300 engine in as compact a unit as possible without any change in the generally conservative engine design philosophy. The space requirement of the single combustor on the GT-300 was unacceptable and the new design incorporated a two-burner gasifier unit with a transmission specially designed for the Firebird.

In order to keep the over-all size of the engine to a minimum, the combustors had to be kept as close to the shaft centerline as possible. The dual outlet air compressor scroll terminates in cylindrical sections integral with the compressor housing and parallel to the centerline of the turbine shaft. Thus, the compressor housing forms the center section of the outer combustion chamber. The outer combustion chamber shell is completed by the domed end, the cylindrical expansion joint section and the double walled outlet elbow. The fuel nozzles and igniter plug are mounted as shown on the combustion chamber dome.

No neutral is provided, the transmission remaining in "High" gear when the "Park" pawl is engaged. Thus the power turbine wheel is always connected to the rear wheels to eliminate the possibility of a turbine runaway that might occur if neutral were provided. This feature is further enhanced by the spring applied

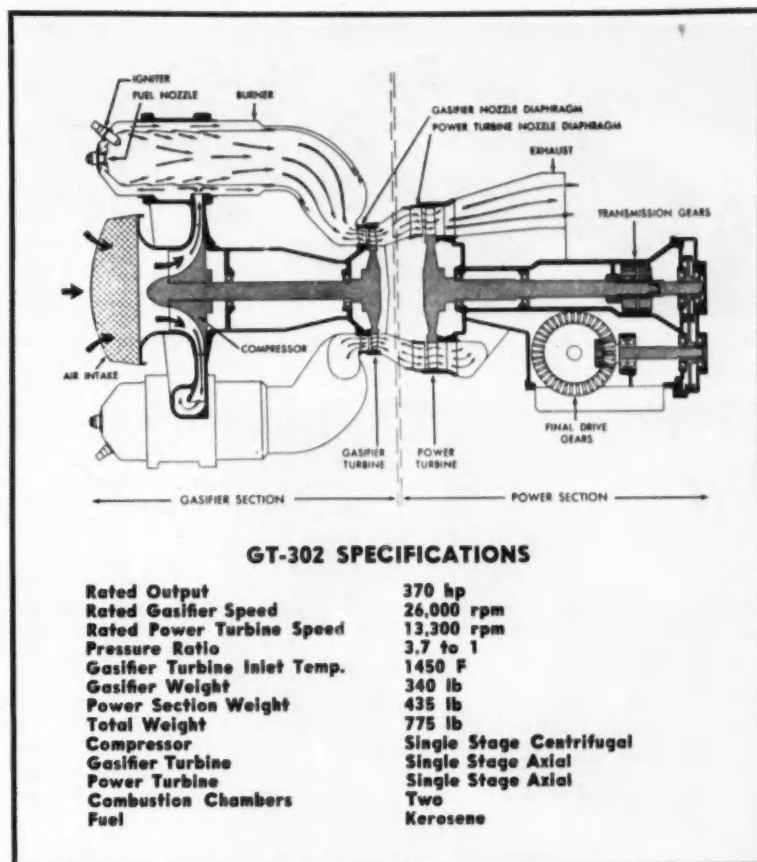


Fig. 1—Schematic diagram of GT-302

"High" gear train brake assuring a safe operating condition in the event of hydraulic failure. The "Performance" setting on the transmission provides for acceleration in a lower gear range. Shift to "High" gear occurs automatically at a predetermined speed.

The sun gear for both the low and high gear planetary systems is formed directly on the extended power turbine shaft. Multiple disk-type holding brakes are used on the high and low planetary systems, and a cone brake is used on the reverse gear system. A pair of transfer gears on the back side of the transmission between the planetary system centerline and the output shaft centerline can be readily replaced to change the over-all turbine-to-axle drive ratio.

The right angle drive gearing and differential case normally housed in the rear axle is enclosed in the transmission housing. However, no differential is used in the Firebird installation. Universal jointed rear axles transmit the power to the rear wheels

and are installed after the power plant is secured to the chassis. The hydraulic system operates all shifting procedures in addition to providing lubrication and cooling for the complete power turbine-transmission assembly. An externally mounted oil-to-air heat exchanger provides sufficient cooling capacity for all operating conditions.

The Firebird Installation

The GT-302 Whirlfire engine as installed in the Firebird chassis is shown in Fig. 2. The exhaust discharges horizontally in a semi-circular annulus above the transmission assembly. All of the hot parts of the engine are enclosed in aluminum radiation shielding ventilated in the same manner as in the GT-300 engine. The gasifier and power sections are independently mounted on a light box section frame of which the compressor case itself functions as a major crossmember.

The unit construction of the power plant greatly simplifies vehicle in-

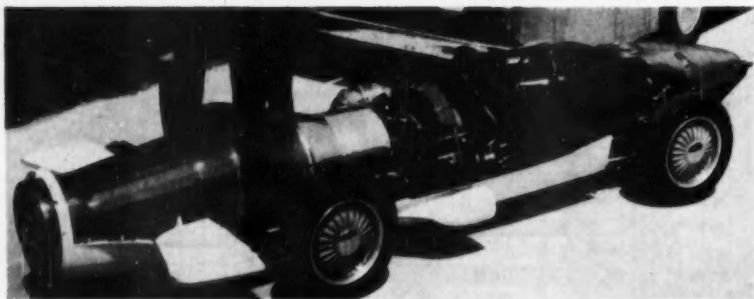


Fig. 2—Firebird chassis with GT-302 Whirlfire engine

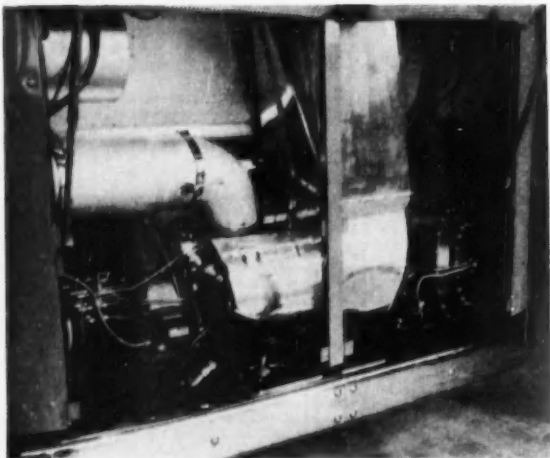


Fig. 3—The GT-300 gas turbine engine installed in a bus

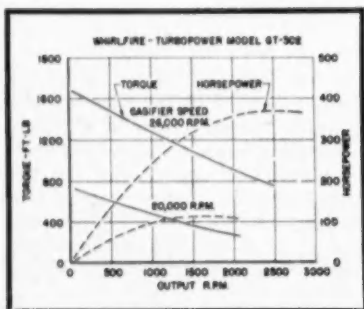


Fig. 4—Performance curves

stallation. A three-point mounting system utilizing resilient, high frequency vibration isolators is employed. Quick-disconnect couplings in the fluid and electrical leads minimize engine installation and removal time.

The Turbo-Cruiser Installation

The selection of a GMC transit bus to function as a test vehicle, named the Turbo-Cruiser, was based on several factors. The engine (GT-300 gas turbine) could be installed in the existing engine compartment with ample space for special test instru-

mentation; the vehicle could be ballasted to represent a wide variety of service conditions with little difficulty; the seating capacity could be used to advantage in demonstrating the new type of power plant; and, finally, plenty of space was available to accommodate special test equipment and observers.

The appearance differs from the Diesel powered unit only in the provision for an exhaust duct discharging through the rear roof crown panel. A closeup of the engine installation is shown in Fig. 3. The gasifier compressor is in the left foreground, the single combustor directly above it, and the aluminum-shielded exhaust duct and hot engine section to the right. A portion of the Vee-drive transmission housing can be seen to the far right.

Operating Experience

Before either the Firebird or the Turbo-Cruiser installations were made, considerable dynamometer testing of both models was accomplished. As both units have the same rotating parts, work on either model was largely applicable to both. However,

as operation of a heavy duty commercial vehicle differs from a light, high performance vehicle, it was felt that both installations would have to be made to obtain information in both areas. As the Whirlfire engine provided much more power than is desirable in contemporary automobile designs, a new design appeared necessary. Further, this allowed new precepts in chassis design to be tried out, giving information in addition to that obtained from the power plant alone. As it was felt that this testing would best be accomplished off public highways, a great latitude in design of the Firebird was permitted. Experience to date with the Whirlfire engines is based on over 1000 hours of dynamometer operation and over 2500 miles of test driving in the Firebird and the Turbo-Cruiser. The bulk of the mileage, however, has been in the latter installation.

Fuel Economy

At the outset of the program, it was recognized that many problems would arise in the development of this power plant. It was decided, therefore, that mechanical simplicity would be emphasized on the first design so that these various problems could be pinpointed. These would then be dealt with in a later design. Consequently, an open cycle unit without regeneration was built, as high fuel consumption was only one item on the list of anticipated disadvantages of the gas turbine in an automotive installation.

At design point an open cycle gas turbine with modest operating temperatures and pressures has a brake specific fuel consumption about twice that of its piston engine counterpart. Further, at part throttle the fuel economy deteriorates more rapidly than in a piston engine. The question immediately arises, "What can be done about this?"

The approaches to improved fuel economy were outlined in the paper presented in 1949 and are essentially unchanged today. First is a continuing improvement in component efficiencies and a reduction in internal pressure losses. Any improvements in these are immediately reflected in improved specific fuel consumption. Secondly is the raising of operating temperatures. Much work has been done in this area by General Motors Research. A new high temperature alloy, GMR-235, developed by the Research Metallurgy Department, has shown great promise in raising operating temperatures.

This material has been incorporated in the first design and the engine under the present design conditions has shown no indication of being temperature limited. It is therefore felt that much can be gained in this area. Finally the addition of a heat exchanger or regenerator to recover some of the exhaust heat will further improve fuel economy. The work in this area has been directed toward the development of a light, compact heat exchanger with good effectiveness constructed of non-critical materials. The work at General Motors Research on the ALDIP process has shown definite promise toward an effective solution to this problem.

The engine is relatively insensitive to the type of fuel it can consume. A broad range of fuels can be used ranging from gasoline to the Diesel fuels. Octane numbers and cetane numbers have no meaning in the gas turbine. The fuel must still possess the same degree of cleanliness as required by piston engines.

Performance

One of the features of the gas turbine that is very desirable in a vehicular power plant is its favorable torque curve. With the dual or free turbine arrangement, the engine produces maximum torque at stall as shown in Fig. 4. This stall torque, which is over twice that of design point torque, decreases almost linearly with increasing output shaft speed. It will be noted that the horsepower curve does not peak sharply, presenting maximum power over quite a broad range of shaft speeds. At present the engine, with all accessories loaded and no correction for reduction gearing or ducting losses, is rated at 370 horsepower.

The maximum torque can be utilized only if the gasifier section is at maximum speed. From a standing start in direct drive, with the gasifier initially idling, a delay in acceleration is experienced which depends on the time required to bring the gasifier to speed. Acceleration characteristics of the Turbo-Cruiser transit bus exemplify what can be expected. The over-all acceleration time is better than in its commercial counterpart operating under similar conditions. Starting from a standstill in low drive appreciably improves acceleration at low vehicle speed.

The effect of the inertia of the engine rotating parts is evident from the delay in the early part of the acceleration curve. In order to minimize this delay, the moment of inertia

of the rotating gasifier components must be kept to a minimum. It now appears that the original design can be improved in this respect. Experience indicates that the limiting acceleration temperature can be raised appreciably above design temperature without any adverse effects. This will

also help to decrease acceleration delay.

The acceleration is extremely smooth, entirely without any jerks or jolts. Further, the power is applied so smoothly that the maximum coefficient of traction can be maintained.

Full Torque Shifting Transmissions for Commercial Vehicles

By D. T. Sickelsteel

General Manager
Products Development Laboratory
BORG-WARNER CORP.

THE need for full torque shifting transmissions in the commercial field has long been recognized, but the many different requirements of the field make the transition from mechanical to automatic drives a much more cautious evolution than in the passenger car field. The problem also presents so many cost, weight, and size limitations, together with conflicting requirements for performance, feasibility and efficiency as to make it a very difficult job.

A major part of the commercial field is long-haul highway trucks. The highway haulers use long-life engines

governed to safe speeds, and desperately need to keep the engine speed near governed top to assure maximum performance and efficiency. The sliding gear transmissions with auxiliary transmissions and two-speed axles in some present designs now use 10 to 12 successive gear steps of approximately 1.3 ratio to cover an overall reduction of 13.6 to 1. They now provide highly efficient drive ratios for every gradient encountered on all principal highway routes. Any new transmission introduced has a difficult job to equal or exceed the performance of the present sliding gear multiple transmissions used in the highway haulers. Economy is as important as performance, as the biggest expense in the long distance

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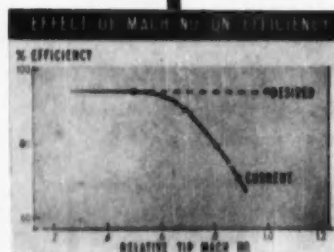
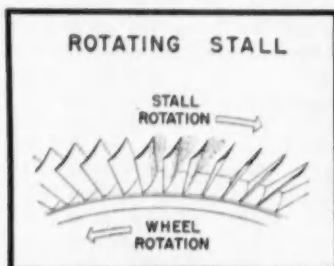
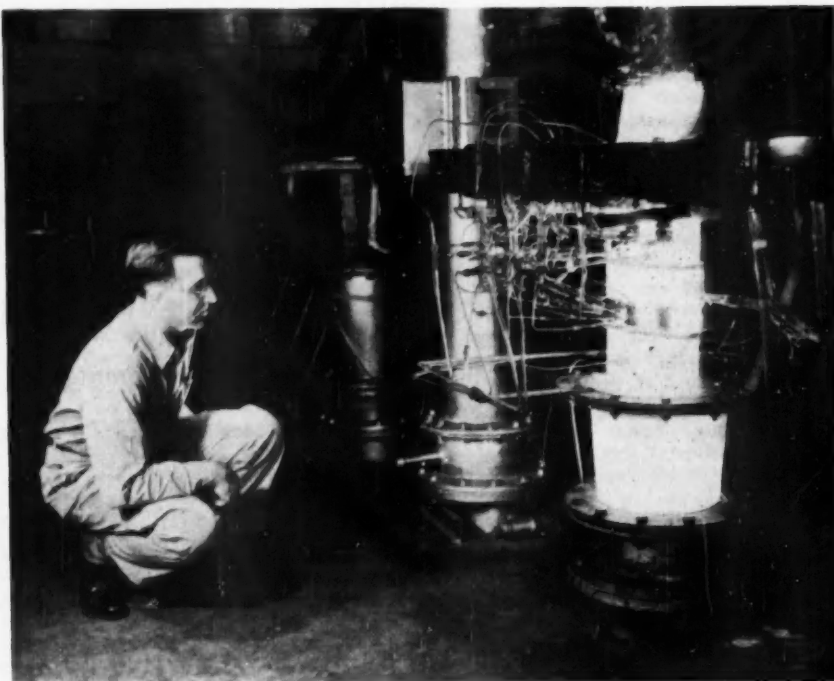
TABLE I
Passenger Cars
LIST OF OVERDRIVE AND AUTOMATIC TRANSMISSIONS
USING PLANETARY GEARING

	Start of Production	Total Production Approx.*	Daily Production Facilities	Used in Following Cars
WARNER GEAR OVERDRIVE (Step-up unit used with conventional transmission)	1934	5,786,000	5,000	Ford, Mercury, Hudson, Kaiser, Packard, Nash, Studebaker, Willys, Lincoln, Plymouth, Henry J, DeSoto
HYDRA-MATIC 4-Speed-coupling transmission	1939	4,630,000	4,500	Oldsmobile, Cadillac, Pontiac, Lincoln, Nash, Kaiser, Hudson
DYNAFLOW 2-Speed-converter	1948	1,815,000	2,000	Buick
ULTRAMATIC 2-Speed-converter	1949	253,000	500	Packard
DETROIT GEAR 3-Speed-converter	1950	233,000	600	Studebaker, Hudson, Jaguar
POWERGLIDE 2-Speed-converter	1950	1,633,000	3,000	Chevrolet
MERC-O-MATIC 3-Speed-converter	1950	1,170,000	3,000	Mercury, Ford
POWERFLITE 2-Speed-converter	Summer 1953	135,000	2,500	Chrysler, DeSoto, Dodge

The Warner Gear Overdrive, General Motors Hydra-Matic, Detroit Gear Automatic and Chrysler Powerglide, use simple planetary gearing (single pinion). The General Motors Dynaflo, Powerglide, Packard Ultramatic and Borg-Warner Ford Merc-o-matic use double pinion planetary gearing.

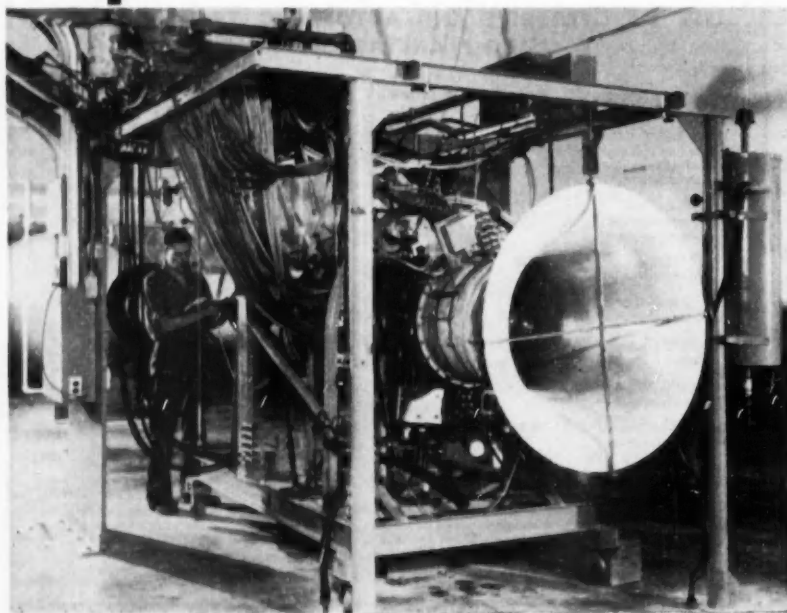
*—From time first introduced to trade through Dec. 31, 1953.

In this glowing combustor operating between 1500 F and 1600 F, data are being gathered on ignition, coke deposition, temperatures, pressures and combustion efficiency. Other fuel research studies are devoted to the improvement of jet engine afterburner and high speed ramjet engine performance. Flame speed has been found to be a good index of a fuel's burning efficiency. One such special fuel, a petroleum derivative named propylene oxide, has a flame speed of 2.29 fps as compared to 1.12 fps for regular jet fuel.

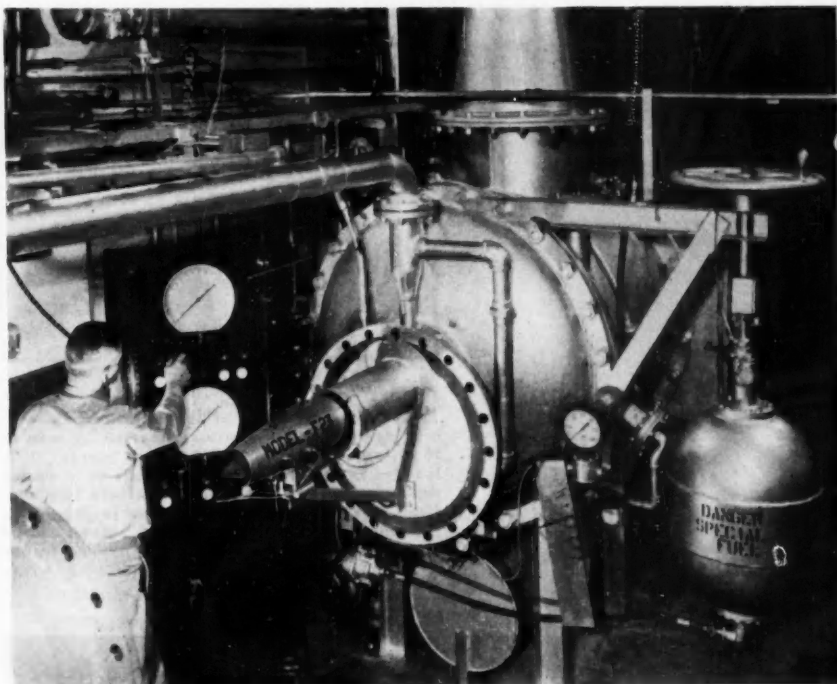


Gas Turbine and Supersonic

Portrayed Here Are Several of Many Engineering Underway in the NACA Lewis Flight Propulsion



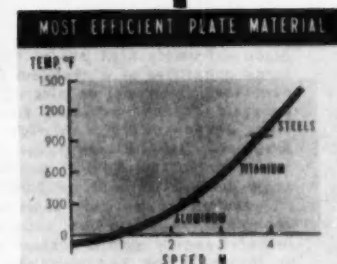
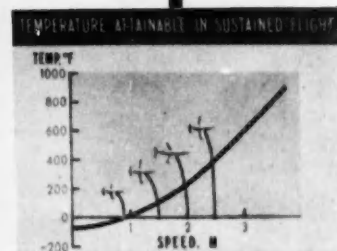
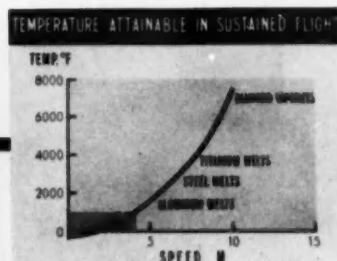
For studying the airflow inside the compressor of this turbojet engine, some 200 internal pressure measuring stations and 70 temperature recording points have been installed to obtain data on the compressor's characteristics at speeds around 12,000 rpm. The test stand also is equipped to measure static thrust. When the airstream passing through the compressor rises above a certain speed (about Mach 0.7 for compressors with conventionally-shaped blades) efficiency drops rapidly as shown in the accompanying chart. Unpredictable blade vibrational stresses encountered when the engine is operated from its design point are due to rotating stall conditions at the blades.



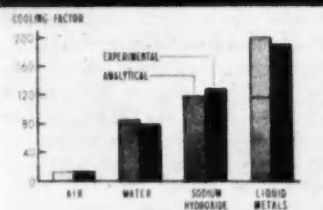
Flight Research

**Investigations at the Present
Laboratory, Cleveland, Ohio**

After a final check on the instruments, an enclosure will be placed over this experimental ramjet model setup. It will be operated in a blast of air under actual burning conditions at supersonic speeds. Tests are made as high as Mach 3.5 (2310 mph). Aerodynamic heating problems are encountered at these supersonic speeds and they are shown in the three accompanying charts. Rocket-propelled models have been used to study surface heating in the range of Mach 5.

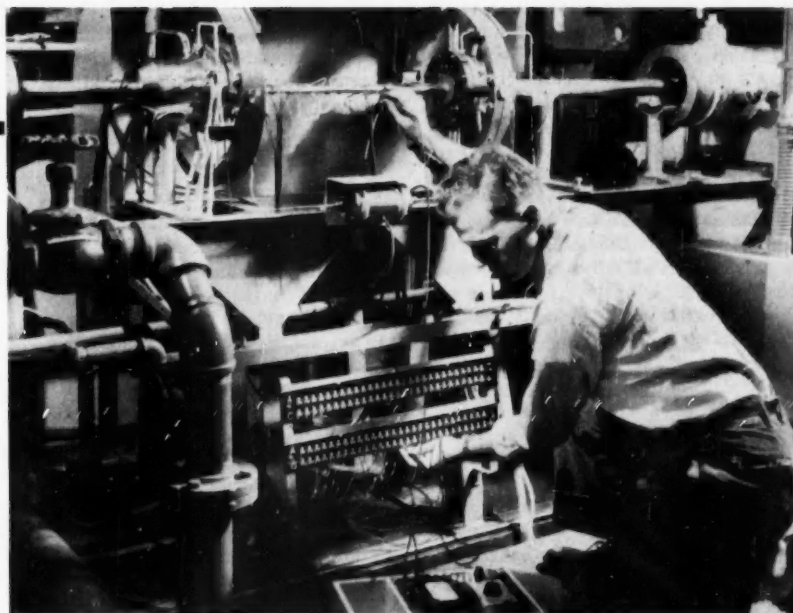


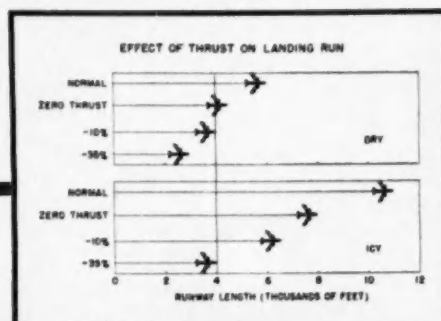
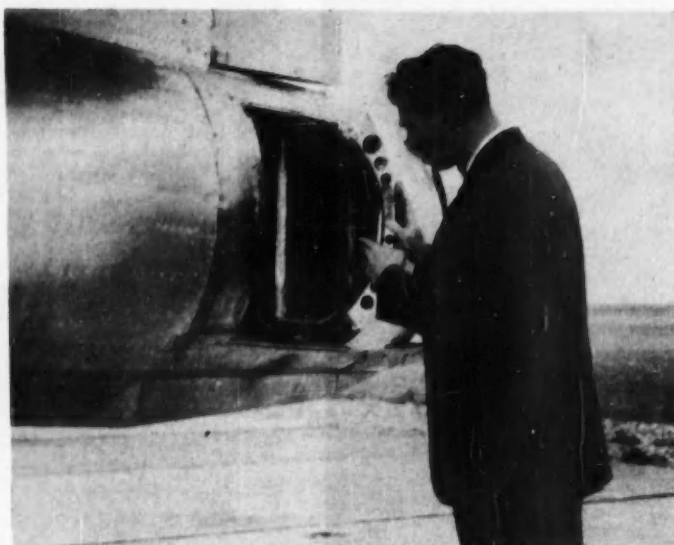
COMPARISON OF POSSIBLE COOLANTS



This equipment is used to obtain heat transfer data on water and other liquids at very high temperatures and pressures as encountered in high Mach speeds. Liquids are pumped through the tube, which is heated electrically. It is designed for tests up to 1200 F and 3000 psi.

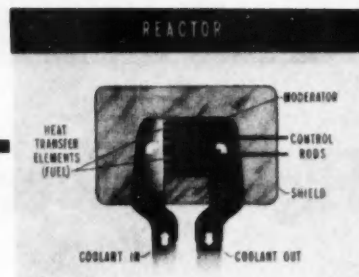
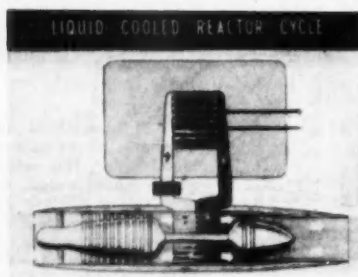
(Photo Story continued, next page)





To counter the effect of thrust in landing, several devices are being tested by NACA, one of the most promising being shown here. It is located in the tailpipe and consists of a double set of curved vanes, which open into two sections to produce reversed thrust. In the photo the vanes are in open position. When closed they form a panel to minimize resistance to gas flow.

Since extremely high power and extra large quantities of a chemical fuel are necessary to propel an aircraft at supersonic speeds and long range, nuclear energy offers a solution to this problem. Fission of one pound of uranium ($1\frac{1}{2}$ in. cube) will produce the same amount of heat as 2,000,000 lb of gasoline. A possible solution is to replace the combustion chambers of turbojet engine with a nuclear reactor as shown in the accompanying drawings. Shielding and heat transfer are problems being investigated by NACA.



Tubeless Tires as Regular Equipment on Passenger Cars

THIS is the year of decision on tubeless tires. Judging by statements on an "off-the-record" basis by some motor car manufacturers and what has been said recently by the major tire makers, it is safe to say that tubeless tires will be offered by three or four makes—maybe more—as optional equipment on 1955 models. Car buyers probably will be offered a free choice of either conventional tire-and-tube or tubeless equipment without extra cost. At least that is the plan at this writing.

Packard is taking the lead in the automobile industry in offering tubeless tires as a standard equipment option. Beginning July 1, the company offers a choice between conventional tire and tube and tubeless tires at no price penalty. The tubeless tire offered by Packard is not the premium priced puncture proof type which has been common in the replacement market, but nevertheless

is considered safer than the conventional tire and tube combination, in which the surface of the inflated tube is under high tension and ruptures violently when it is punctured or fails for some other reason.

Tubeless tires are no longer a novelty. They have been on sale by dealers for some five years and millions of them are riding the highways. However, up to this point tubeless tires have been super deluxe equipment, puncture proof, selling at top prices. It was realized by everyone concerned that unless such tires could be produced to sell at the price of conventional tire and tube assemblies there was little hope of their general adoption as standard equipment in passenger cars.

It has taken time, many years in fact, but several things of major importance have borne fruition. In the first place, the major producers now are making tubeless tires that com-

pare in price with conventional tire and tube assemblies. These tires do not offer puncture-sealing construction, nor do they have the special form of tread design featured on extra priced tires. On the other hand, they do retain some of the safety features of the higher priced tires such as improved riding quality, and a greater measure of protection against blowout.

Tire companies, therefore, have removed the major hurdle to adoption as standard equipment—price. With tubeless tires priced at the same level as conventional equipment, motor car producers can approach their adoption with much more enthusiasm.

During the past few years the motor car companies have had ample opportunity to test the new tires and satisfy themselves as to their safety and durability. It will be recalled that last year Packard was the first—and

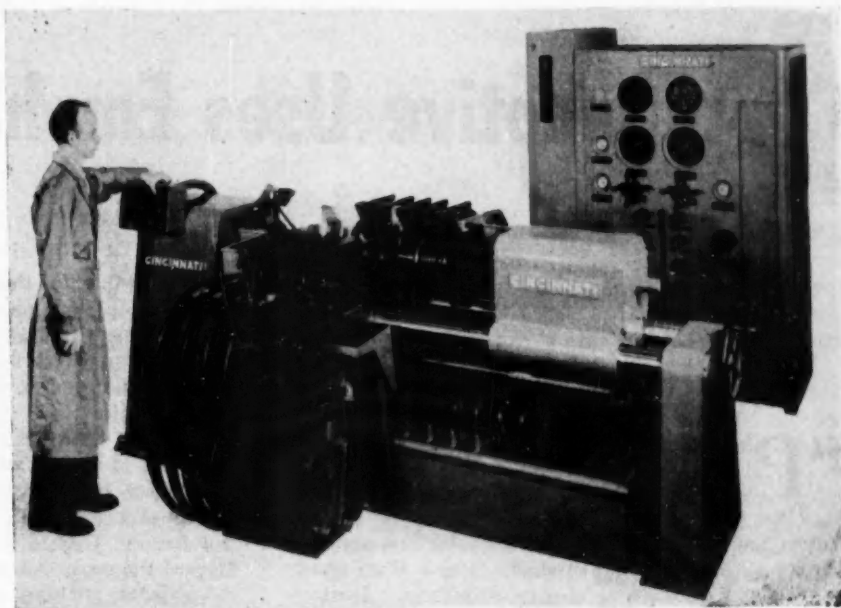
(Turn to page 92, please)

View of Cincinnati Flammatic unit designed for small-lot hardening of crankshaft journals and pins.

NO**T**ED for its innovations in production practice over the years, Dodge Division, Chrysler Corp., has scored another "first" with the adoption of a Cincinnati Flammatic crankshaft hardening machine designed specifically for job lot operation as well as experimental runs. The machine illustrated here, designed and fixtured for V-8 engine crankshafts, is extremely flexible and offers quick changeover for a variety of crankshaft sizes. Since it is intended for lot production, the operating cycle may be characterized as semi-automatic rather than fully automatic.

At Dodge this machine is being employed for hardening main bearing journals and pins on V-8 engines intended for installation in trucks and for industrial uses. Flexibility of operation stems from the ability of changing over from one shaft to another by changing the positioning of the burners, changeover time being around two hours at the most.

In operation, the main bearing line is hardened first, in a fully automatic cycle after the machine operator presses the "start" button on the control panel at the extreme left. Pin hardening, on the other hand, is a step-by-step cycle which requires the operator to press four "start" buttons successively. However, once a cycle has been initiated, the machine functions automatically to harden and quench by means of the elec-



Semi-Automatic Machine Hardens Variety of Crankshafts

tronic control cabinet in the background. It controls the feeding of gas and oxygen, initiation of ignition, timing of the burners, and quenching time.

It may be noted that in hardening the four pins, an indexing mechanism contained in the head- and tail-stock locates the centers for the rotation of each pin on its own axis.

Generally speaking, pins and journals are hardened to 55-60 R_c, the depth of case, controllable by temperature as well as time, being specified at 0.125 in. minimum after finish grinding. On the average, journals are heated for 45 seconds, while pins require only 33.6 seconds. Water quenching takes 14 seconds.

Independent Car Makers Optimistic About Sales

While automobile sales so far this year were still more than five per cent under the same period last year, dealer reports are encouraging, and the independents' share of the market was expected to make some gains in the coming months. Production for the first six months of this year was

estimated at close to three million units, compared with about 3¼ million in the like 1953 period.

Sales for the first four months of this year, as reflected by registrations, totaled 1,699,123, about 98,000 units short of the comparable period last year. The selling rate during May, however, was estimated at close to 10 per cent higher than the preceding month as a result of consid-

erably tighter production schedules.

Most GM divisions continued to trim their daily output rates, while Ford kept in high gear, with several of its plants operating on Saturdays. The Big Three continued to hold more than 95 per cent of the total car output up to June, and the combined independents' total was estimated at slightly under 115,000 for the first six months.

Automotive Uses Emphasized at

By Thomas MacNew

"PLASTICS in Automotive Equipment" could well have been the theme of the Sixth National Plastics Exposition held in Cleveland last month. Most all of the 175 exhibiting companies had a product or service available and applicable for automotive use. Products ranged from small nylon gears to a Corvette of glass-reinforced polyester, as well as a large truck section of the new material. Companies engaged in services offered a range from custom molding to final testing.

All phases of plastics manufacture were represented at the show sponsored by the Society of the Plastics Industry. These were: molding, lamination, extrusion, fabrication, reinforced plastics products; film, sheeting and coated fabrics; raw materials, machinery and equipment, including tools, dies, molds, and testing and research methods.

Automotive Sessions

In addition to the four-day show, a technical conference sponsored by the SPI was run simultaneously. One day of the technical session was set aside solely for automotive plastics applications. A novel feature of this meeting was that the papers were given primarily by the users rather than the suppliers.

At this meeting, presided over by W. J. McCortney, superintendent, Rubber and Plastics Laboratory, Chrysler Corp., there was one paper on molding compounds, three on the structure and use of plastic tooling, and one on the Chevrolet Corvette.

J. K. Totten, Ford Motor Co., gave a general paper on the various uses of plastics on the passenger car. Most current components for the typical car are primarily molded products, according to Mr. Totten. One of the most interesting plastic parts of the company's car is the tinted acrylic roof section on Ford and Mercury hardtop convertible models.

Plastic Tooling

The next three papers at the automotive technical session are somewhat controversial. The first, by Robert H. Voss, Warren Plastics and Engineering, Inc., dealt with cast dies made of phenolic material.

Mr. Voss explained that dies of this nature are metal reinforced in some instances to provide for good wearing qualities. Fred Lyijynen, Automotive Body Div., Chrysler Corp., took a stand on the use of glass reinforced polyester dies and glass reinforced epoxy for fixtures. He cited several instances and showed examples of how these materials stand up in production. One of the advantages to these materials is the short lead time necessary for model change-over. Also speaking on dies, die models, checking fixtures, and tooling, George M. Rice, Ren-ite Plastics, Inc., favored the epoxy resins. Some of the advantages are the ease in making the tooling, the long-wearing qualities, and the relative simplicity of repair when necessary. He mentioned that the Ford Thunderbird will contain 18 major parts made from all plastic dies.

The Chevrolet Corvette reinforced plastic car was covered by John G. Coffin of Chevrolet. Much of the material has been previously disclosed in other issues of *AUTOMOTIVE INDUSTRIES*. One of the high spots of his talk was the description of how a Corvette with major front-end damage was readily repaired.

Trucks and Cars

Two very interesting glass fiber polyester truck applications presented at the show were a complete front-end section of a delivery truck produced by General Body Manufacturing Co., Kansas City, Mo., in cooperation with regal Plastic Co., Kansas City, Mo., and the grille section of the United Parcel Service, New York, N. Y., truck produced by Lunn Laminates, Huntington, L. I., N. Y., see *AUTOMOTIVE INDUSTRIES*, June 15.

In the complete car line, Bakelite Co., New York, N. Y., had a Corvette on display along with some of the major parts that make up the complete car. Celanese Corp. of America, New York, N. Y., had a reinforced plastic body sports car called "The Rogue," at its exhibit. The car, which is said to be designed to sell for less than \$2,000, will be made of Celanese Marco resins by Kish Plastics in Lansing, Mich. It is expected that it will be available in quantity this fall. The car utilizes a rear engine Renault chassis.

Another plastic car, the Alembic I, which now has been driven more than 65,000 miles, was shown by the U. S. Rubber Co., Naugatuck, Conn. Harold M. Parsekian, Assistant General Manager, stated that through the extensive testing of the Alembic I, a new polyester resin has been developed. Previously, it was found that there was slight surface crazing at high stress points on the body. The new resin, Vibrin 151,

National Plastics Exposition

with its 5 per cent elongation, is engineered to absorb road shock and other body stresses without crazing. It is currently being utilized for Chevrolet Corvette and Kaiser Darrin production.

Materials and Machines

American Cyanamid, New York, N. Y., disclosed a glass-filled electrical graded melamine molding material called Melmac 3135. This new combination of plastics and glass fiber is said to offer high strength and excellent arc resistance. Its heat distortion point is in the 200 degrees centigrade range.

The Fellows Gear Shaper Co., Springfield, Vt., had the first showing of its No. 6-200 injection molding machine. This unit has a six-ounce capacity and can operate in the 500 cycle per hour range. It exerts up to 20,000 psi on the material.

A wet blasting process using the Liquamatte machine for cleaning and finishing plastic molds was exhibited by American Wheelabrator & Equipment Corp., Mishawaka, Ind. This machine leaves a fine textured matte finish that will hold a lubricant well in service.

With a theme of "Dow Plastics are Application Engineered," The Dow Chemical Co., Midland, Mich., displayed 123 products made of its plastic materials. The products were made of Saran, Styron, Styrofoam, Ethocel, and polyvinyl chloride.

Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, had in operation its new six-to-eight-ounce injection molding machine. This unit is completely automatic and is equipped with low pressure mold protection and an open cycle timer. Its new straight line hydraulic mold clamp provides for fast closing and opening speeds. The company also displayed its 20-to-28-ounce capacity machine. This is of the same automatic type and is all hydraulic in operation. It is capable of injecting 1330 cu in. of material per minute.

B. F. Goodrich Chemical Co., Cleveland, Ohio, had a very interesting demonstration of the forming of calendered Geon rigid vinyl. The material utilized, Geon 81067, has an extensibility of 600 per cent at its optimum forming temperature of 260 to 275 F. At room temperature its ultimate elongation is about 10 per cent. For the demonstration a Chromalox heater and a Hannifin press were used. A new, lightweight vinyl plastic impregnated high tension aircraft lead-wire made by Scintilla Div., Bendix Aviation Corp., is one of the recent industrial applications of the firm's Geon vinyl paste resin.

A great variety of products was displayed by E. I.

du Pont de Nemours & Co., Inc., Wilmington, Del. One of the big features of the exhibit was the Mylar polyester film. This highly tear resistant product will be used as a coating for automotive scuff pads.

The theme of the Du Pont exhibit stressed the designers skill. It highlighted contributions of the company's plastics to all fields of American industry, showing how skillful engineering of products makes it possible to take full advantage of unique properties of these materials. Du Pont also brought out its trade name for nylon resin, called Zytel. Applications of the firm's plastics were shown in four broad categories—chemical, electrical, mechanical, and decorative.

Marine Applications

A portion of a 50-ft self-propelled reinforced plastic barge was shown by the Englander Co., Inc., Plastics Div., Baltimore, Md. The material used is a honeycomb duck impregnated with a phenolic resin sandwiched between reinforced plastic.

Two experimental items made of glass reinforced polyester were prominently displayed by the Aircraft Div., Goodyear Tire & Rubber Co., Akron, Ohio. One of these was a plastic detachable top for a sports car made by the matched die process. The other item was a 14 ft boat made by the bag molding method. The Chemical Div. of the company showed among other materials its Plio-Tuf, a high styrene copolymer for molding impact resistant articles. Features of the product include high heat resistance, hardness, rigidity, and high tensile strength.

Resins

Cast phenolic resins were the highlight of the Marblette Corp., Long Island City, N. Y., booth. This firm does much work in plastic tooling for automotive and aircraft companies. Displayed were cast phenolic draw dies, laminated molds, and stretch plugs along with bonding, coating and impregnating resins.

Three booths were manned by General Electric Co., Pittsfield, Mass., personnel. Featured were silicone products, mycalex molded parts, phenolic compounds, rubber phenolics, laminating varnishes, and polyester resin molded parts. The exhibit also featured G. E.'s new radioactive tracer technique, which is now being used to help formulate improved phenolic molding powders.

Westinghouse Electric Corp., Pittsburgh, Pa.,
(Turn to page 118, please)

THE manufacture of engine valves for the industry at Thompson Products, Inc., is illustrative of the special problems faced by the parts makers. T-P currently makes something over 300 different types of valves, ranging in size from tiny ones for fractional horsepower engines to the largest sizes required for compressors and stationary Diesel engines.

Among these are high volume types for passenger car engines, many small lots, and experimental lots for various customers. To handle these varied requirements the company has developed 11 individual machine lines—some designed for moderate volume, some representing extremely high production, while others are designed for maximum flexibility to handle job lots. With this setup the company has an opportunity of studying the requirements of the entire industry from an engineering standpoint and through specialization has developed production know-how of inestimable value.

Before considering a sampling of manufacturing procedures, it is of interest to note some new develop-

ments in materials and process of recent origin. While continuing with the established valve alloys, T-P has done considerable work with the newer chrome-manganese alloys (21-4-4 type) now being supplied in regular production for some of the new passenger car V-8's. These valves require special metallurgical treatment, special handling where Stellite-facing is specified, and must be machined at a slower rate.

The company is making, in addition to standard valves, various types of sodium-cooled valves, Stellite-faced valves, and has been experimenting with a technique of induction hardening valve seats. Aldip, the unique aluminum coating process developed by GMR, is being readied for mass production here. For some time Aldip operations have been carried on experimentally with a small pilot setup, consisting of a modified Ajax salt bath unit. Before the end of the year the company will have in operation a large, fully mechanized Aldip unit, designed here. The process will then be available to all engine builders.

Since forging is a basic process in valve making, it

Automation Principles Applied to

One of the National Acme screw machines, showing the method of feeding valves into the work station. A portion of the overhead conveyor may be seen in the background. This transports carriers filled with valves past each machine in the line, the transfer from the conveyor to the feeder chute being made at the kick-off station at the machine. The small cross conveyor in the foreground transports the valves into the work station.

Close-up at one of the Cincinnati Centerless grinders on the valve machining line. The overhead conveyor in the background transports valves in carriers past each of the grinders, automatic kick-off of a carrier being made in the station directly at the individual machine. Valves then move down the chute at the left and feed to the grinder automatically.



is of interest to find that T-P has shifted to hot extrusion combined with induction heating of bars and slugs, using Tocco equipment throughout.

Bars are heated either in T-P designed open side gas fired furnaces or, in many instances, in induction heating equipment. The bars then are fed directly into the hot shear presses for shearing into blanks or slugs of proper length. Ejection is automatic, feeding the blanks by conveyor into hoppers.

Extrusion press operation has been fully mechanized on high production valves. To this end, the prepared slugs are fed to a hopper by a conveyor, then from the hopper directly into the induction heating coil, and delivered from the coil to the die by means of a chute. An air cylinder, tied into the system, pushes the blank into the die. Valve forging is a two-stage operation: first extrusion from the slug; then forging to size and form in the second die. For the latter

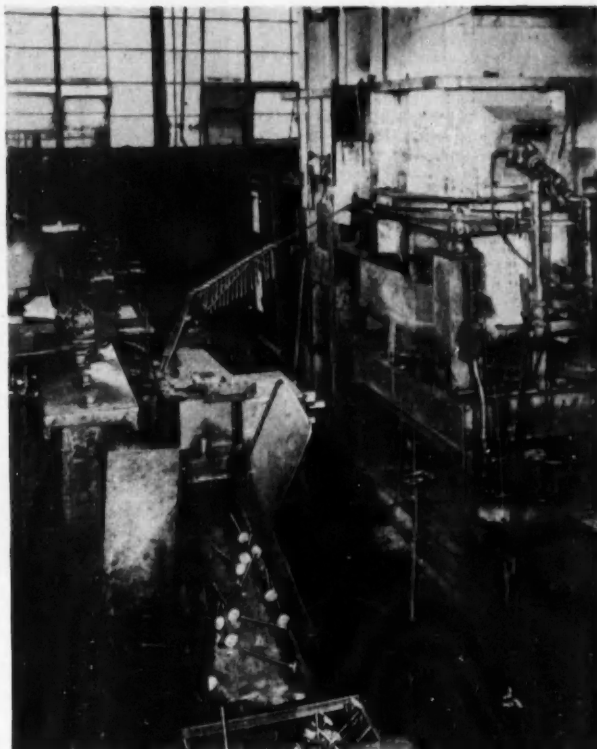
Valve Production

operation the work is fed into and out of the die by hand.

The stem end is cut off to length in a high production grinder equipped with a drum type fixture, cut-off being done with a high speed abrasive wheel. This represents a major advance over the older method of shearing the stem end not only from the standpoint of productivity but also because abrasive wheel cutting results in a clean, square end which can be finished readily by grinding.

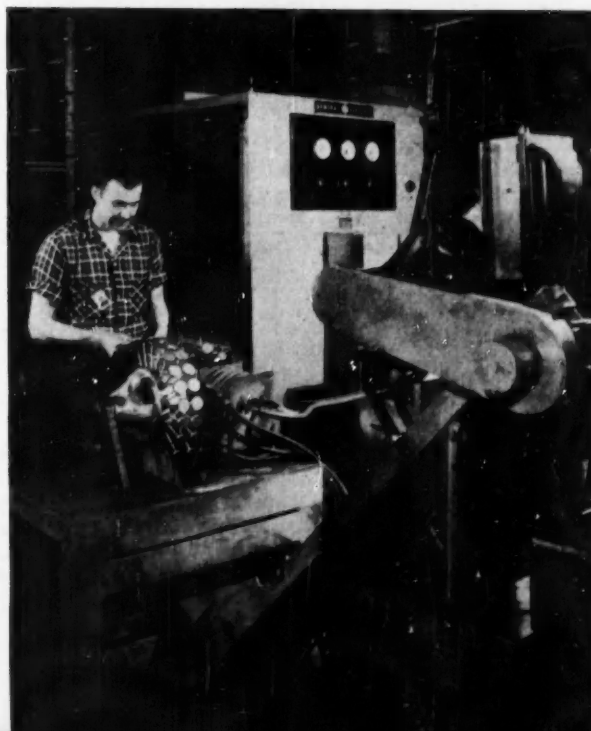
Some indication of the variability involved in serving an entire industry is found in the requirement, on certain makes, of precision straightening of the valve stem to prevent even minute warpage at high temperatures. In this instance the valve stem is hot rolled to achieve straightness. To accomplish this, valves are fed into a Surface-Combustion furnace for heating to forging temperature, come out automatically to a chute leading directly to the adjacent Waterbury-Farrel thread rolling machine. Hot rolling is quite similar to thread rolling except that the dies are flat.

Obviously a parts maker has little opportunity to take advantage of full automaticity in a machining line, except on extremely high volume setups. Automation is exemplified at T-P on sev-

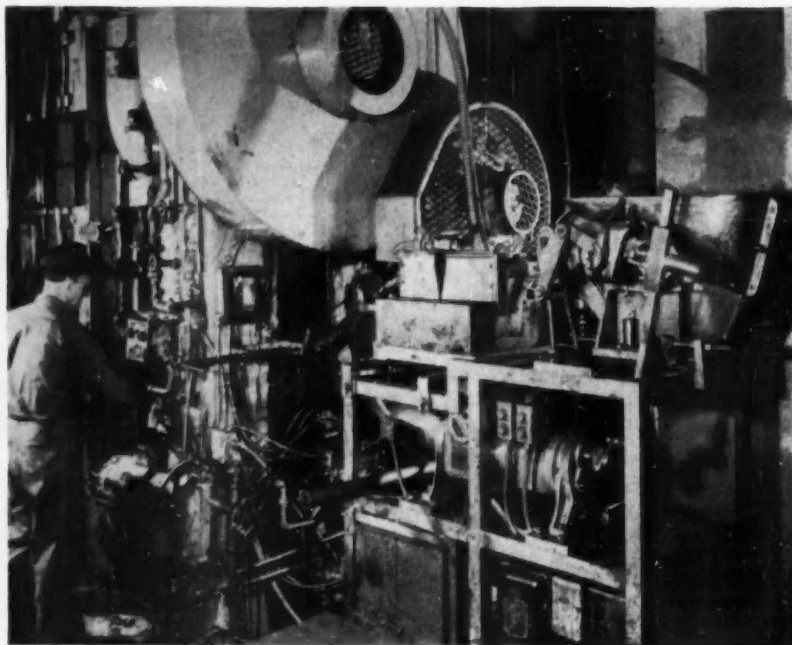


This illustrates the equipment for hot-rolling of valve stems for certain types of valves. The Surface-Combustion furnace is at the right. Valves may be seen leaving the furnace on the chute which leads directly into the roll straightening machine at left.

New General Electric induction heating machine for hardening, valve tips. The operator loads valves manually into the fixture as shown. Valves drop out of the fixture by gravity as the drum reaches bottom position.



Here is typical view at one of the numerous forging presses. The prepared slugs are fed into the hopper at the right, mounted on the pedestal. From the hopper they feed into the induction heating station directly to the left of the hopper. Heated blanks then move down the chute leading into the first die station.



eral high production lines, one of which is described and illustrated here.

The machine line is fully self-contained, and comprises two parallel lines of equipment served by an overhead conveyor. A belt type conveyor, near floor level, also is installed along each line of machines. At the start of the line, valve forgings are loaded into a large hopper, then the valves are transferred by operators into carriers and placed on the overhead conveyor for feeding the line of Cincinnati Centerless grinders. A kick-out mechanism, timed with the cycle of the grinder, is installed on the conveyor at each machine, serving to release a carrier at a given time, permitting the valves to drop down a chute into the feed mechanism of the grinder. This procedure provides for automatic loading of the grinder line. As grinding is completed, the valves are automatically ejected, drop onto the belt conveyor and then return to the hopper at the start end.

The operators then repeat the procedure of loading valves into carriers and mounting the carriers on the overhead conveyor, except that this time the carriers are loaded on the opposite side of the conveyor chain for removal on the opposite row of machines. Here the conveyor traverses a long line of six-spindle National Acme-Gridley automatics tooled for machining head OD, seat, carbon relief, and shoulder in a single setting. As these operations are completed, valves are ejected onto the belt conveyor. In this case the belt conveyor runs to the rear of the line, automatically transfers the valves to a flight conveyor feeding a line of special Ex-Cell-O grooving machines. In a fully

automatic cycle these special machines finish the retainer neck, point, and chamfer.

The Ex-Cell-O machines are quite flexible, readily changed over for a variety of valves. More recently, the company installed single-purpose equipment for certain high volume valves. This is a small four-spindle National Acme-Gridley automatic, employed only on continuous setups.

At this point valves go to heat treat for hardening, then sand blasting, and hand straightening of head and stem.

The valve tip is finish-ground in a single-wheel, horizontal type Besly grinder, fitted with a 15-station drum type fixture, the operation being held to extremely fine tolerances. Surface finish at the tip is held to 15 micro-inch or less, while squareness is held to 0.0006 in.

All valves require a hardened stem end to resist wear. Latest development in this connection is a General Electric induction hardening machine, serving a drum type fixture, rotated at constant speed by remote control. Valves are inserted into the drum from the outside, the tip projecting into the interior and wiping past an inductor block. The operator loads the drum manually and the valves fall out by gravity.

Northrop Rocket Sled to Aid Study of Bailing Out Effects

Ground speeds up to 800 mph may be attained by a rocket-propelled test sled operated by the Aero Medical Field Laboratory at Holloman Air Force Base, N. M. Purpose of running the track-carried sled is to learn

the effects produced on fliers who may bail out at very high altitudes and at supersonic speeds.

Designed by Northrop Aircraft, Inc., the apparatus consists of a propulsion sled, weighing about 3500 lb and capable of carrying a dozen 4500-lb-thrust rockets, and a one-ton test vehicle to accommodate the rider.

Heavy steel tracks solidly emplaced in a concrete bed carry the sled.

Braking device on the 3500-ft test run is water, contained in two levels below the track. Metal scoops mounted below the sled funnel water from the trough and expel it through vents, thus slowing the sled where and when desired.

BY GEORGE MURPHY
Time Study Engineer
Heater Division
Eaton Manufacturing Co.

MAKING and PAINTING Car Heaters

by Timesaving Methods

IN an effort to lower the cost of welding components for automobile heaters which it manufactures, the Heater Division of Eaton Manufacturing Co., Cleveland, realized multiple benefits through the installation of two, two-sided Sciaky automatic welding machines.

The welding stations are located at near the start of an extensive overhead conveyor system. Purchased stampings are hung on the conveyor as it passes the incoming storage department, and are carried a short distance to the welders.

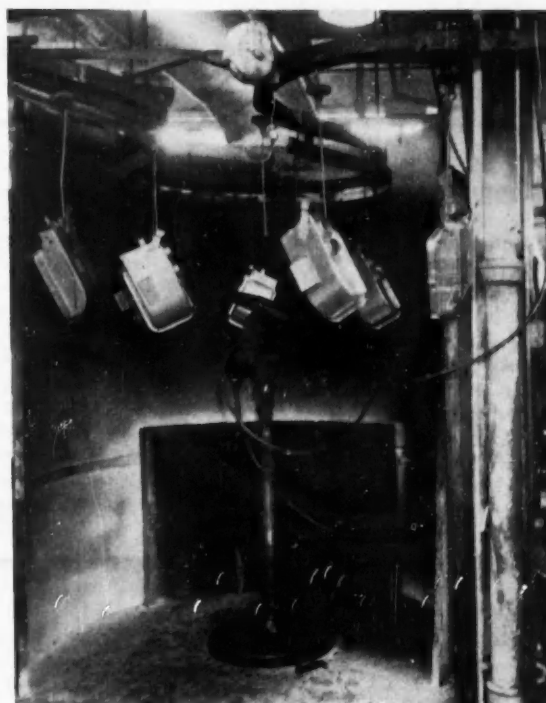
Two basic sub-assemblies are fabricated, inlet ducts and blower housings. Under the old system, inlet ducts arrived at welding stations in two halves which were first riveted, a requirement to pre-position the two pieces for subsequent welding. After riveting, the parts had to be manually spot welded eight separate times.

The second of the sub-assemblies, blower housings, required even more physical effort. After shipment in three separate pieces, the mounting bracket, the flange, and the housing—the first step was the riveting of the bracket to the housing prior to a series of six individual spot welds, each performed manually.

(Turn to page 104, please)



Three separate operations were formerly required to rivet and weld components of blower housings. Now, the bracket is first loaded in the Sciaky welder, then the inlet flange is loaded and secured. As the machine is cycled, the top eight guns series-weld a like number of spots on the inlet flange. Finally, four side guns are actuated and direct-weld the mounting bracket to the housing.



Parts enter the Ransburg booth, circle past the sprayer, and emerge evenly painted. A more uniform job with negligible paint waste are benefits of the new system. Note the extreme cleanliness of the walls of the booth—nearly a week's paint accumulation.

Gear Tooth Fatigue Discussed at AGMA Annual Meeting

EXECUTIVES and engineers, comprising a record-breaking attendance, were presented with an extremely interesting program during the four-day 38th Annual Meeting of the American Gear Manufacturers Association held in Hot Springs, Va., last month. In addition to the technical sessions, at which five papers were presented, the Association held its annual election of officers.

Officers elected and installed during the affair are

headed by Richard B. Holmes, general manager, Link-Belt Co., Philadelphia, Pa., who is the new president of the AGMA. Mr. Holmes' staff includes Marvin R. Anderson, executive vice president, Michigan Tool Co., Detroit, as vice president; and Fred R. Eberhardt, president, Eberhardt-Denver Co., Denver, Colo., as treasurer. New members of the AGMA executive committee are LeRoy R. Brooks, president, Tool Steel Gear & Pinion Co., Cincinnati; Ralph E. Rawling, president,

Fatigue Strength Characteristics of Gear Teeth

HELICAL GEAR TEETH

By E. J. Wellauer
Assistant Chief Engineer
The Falk Corp., Milwaukee, Wis.

A SUMMARY of the material gathered through testing and other available evidence makes possible the following comments regarding the fa-

tigue strength characteristics of helical gear teeth

1. The helical gear tooth departs widely from laboratory fatigue specimens in accuracy of stress analysis, response of stress character and magnitude to load in geometric shape, etc., and requires extensive testing to ob-

tain fatigue strength characteristics.

2. Minimum life of helical gears with accuracy and materials of high commercial quality can be fairly accurately estimated.

3. Scatter in life data similar to that shown by ball or roller bearings is to be normally expected. Accord-

BEVEL GEAR TEETH

By Wells Coleman
Gear Engineer
Gleason Works, Rochester, N. Y.

IS there an endurance limit for gears? Fatigue tests on many machine elements have shown an endurance limit for steel at a stress level corresponding with a life of 10,000,000 cycles. To run tests for more than 10,000,000 cycles is expensive, and few laboratories have carried out large scale test programs involving such long runs on gears. For this reason, data relating to the endurance

limit for gears is sparse. There is a reasonable chance that the fatigue curve does level out at some point beyond 10,000,000 cycles. However, it is convenient to assume a sharp knee and an endurance limit even though exact data are not yet available.

At a stress level of 30,000 psi for bevel gears it was noted that the minimum estimated life is approximately 6,000,000 cycles. The maximum life may be very great. Do not be misled into thinking that the endurance stress is higher just because the gears do not

fail in less than 10,000,000 cycles.

The greatest problem in fatigue testing is the control over variables. Extra care should be taken to insure uniformity of the gears and housings in manufacture. Small differences here will lead to a wide spread of points. When trouble develops during the test, first make a thorough check of the gears and housings as they exist. Having made certain that everything is in order as far as manufacturing quality is concerned, the second step is to proceed in an orderly

SPUR GEAR TEETH

By Darle W. Dudley
Supervisor, Gear Advance and
Development Engrg.
General Electric Co., Lynn, Mass.

EFFECT of Number of Cycles—Much of the fatigue data that has

been published on things other than gears show a straight line on log-log paper. Many of those who have run gear tests have tried to depict their data as showing (except for scatter) a simple straight line on an SN diagram. Tests of spur gear teeth show that the true diagram follows a

characteristic pattern which is divided into three regions. These are as follows:

Region	Range of Cycles	Slope
1	1 to 1000	very little
2	1000 to 300,000	steep
3	300,000 to 1 billion	very little

In the steep slope region, a ten-fold

Rawling Gear Works, Worcester, Mass.; T. F. Scannell, general sales manager, The Falk Corp., Milwaukee; and John A. Sizer, president, Industrial Gear Manufacturing Co., Chicago. The new members of the committee will serve three years.

Of the five papers presented at the technical meetings, three made up a symposium on the "Fatigue Strength Characteristics of Gear Teeth." Extracts of these papers are presented later in this article. Both of the other two papers dealt with mathematics.

J. E. Van Acker, quality control supervisor, Gould & Eberhardt, Inc., Irvington, N. J., in his paper, "The Span System of Measuring Involute Gear Tooth Size" presented an expansion and modernization of the method published by Mr. Wildhaber in 1923. The system is based on the geometric fact that any normal to any involute tooth surface will be contained in a plane tangent to the base cylinder. Consequently, two parallel caliper jaws will tangentially contact oppositely facing profiles in a manner similar to the diameter measurement of a cylinder and with a similar

feel. No edge contact is ever obtained under correct measuring conditions. The measurement is directly related to the thickness of a single tooth (or the backlash the gear contributes to the assembly) inasmuch as the measured distance is composed of a number of pitches (which are constant) plus the thickness of a single tooth.

The paper, "A New Look at Wormgear Hobbing" by Ernest Wildhaber, gear consultant, Rochester, N. Y., covered surface curvature as applied to worms and worm gear hobs. It was read by Allan H. Candee, gear consultant. The author presented several comparatively short formulas to determine the correct hob-setting angle, what can be accomplished by hob oversize toward improving contact conditions, and the changes that occur on the surface of a wormgear tooth when the hob becomes smaller in diameter (through sharpening) and used at decreased center distance.

Extracts of the papers presented at the symposium, sponsored by the AGMA's gear rating coordinating committee, follow:

ingly, the life must be evaluated statistically. Tests of one or a few sets of gears are rather meaningless.

4. Allowable stresses for gear design are apparently 30 to 60 per cent of those secured from laboratory tests.

5. Stress concentration caused by root fillets and root fillet surface finish

is important in determining life.

6. No distinct "knee" appears to exist in the stress-life relationship and conservative design requires a straight line extension of the minimum life boundary.

7. The effect of variable load must be determined more adequately al-

though evidence indicates that cycles at low load values do not have a damaging effect.

8. Residual or internal stresses at the root fillet affect the life favorably or unfavorably depending upon whether these stresses are compressive or tensile.

fashion to make the necessary engineering changes. Do not make several changes simultaneously "to fix the job." By so doing you will never know what effect each of the several changes has. Make one at a time.

Suppose it is desired to determine whether 4820 steel or 4620 steel is superior for a pair of bevel gears in a heavy-duty tractor. The manufacturer makes up ten or fifteen sets of gears from each material and runs a series of tests. The conclusion of these tests shows that 4820 steel will carry

10 per cent more load than 4620 steel. Meanwhile another concern working with much smaller gears runs a similar series of tests and concludes that 4620 steel is superior to 4820 steel. The metallurgist will point out that 4820 steel is superior for heavy section and 4620 steel is superior for light sections. For this reason a "material factor" for each of these materials may be misleading unless the working limits are carefully defined.

If one knows the exact speed and load data and the required life, the

problem of establishing a fatigue chart for gears is relatively simple. But most applications involve uncertain loads and unknown shock conditions. This requires intelligent guessing until service factors based on field experience can be worked out. In some fields service data is readily available, but in many fields it is not, so that the gear designer must work under difficulties. However, as the designer does gain experience with the use of the fatigue chart, he can predict his gear sizes much more reliably.

increase in cycles will drop the load capacity about 35 per cent. Beyond one million cycles the drop in capacity is less than 10 per cent when the cycles are increased ten fold.

Most of our tests have been stopped at around 10 million cycles. A few simple beam tests have been carried

to 1 billion cycles. In a pinion tooth test comparing shot peened teeth with teeth not shot peened that were run out to 200 million cycles there is no evidence of a steep slope in the region beyond 1 million cycles. Shot peening some of the teeth of a pinion showed those peened to be about 35 per cent

stronger. In this particular case, the peening was done by hand and was not entirely uniform. Pinions peened by machine have shown upwards of a 40 per cent gain in strength.

Effect of Hardness—There are several observations about the effect of
(Turn to page 80, please)

Cold Rolling of Splines

—a New Process for Steel Shafts

DEVELOPMENT of another new cold forming technique—the rolling of splines on steel shafts—has just been announced by the Michigan Tool Co. It also can be used to produce serrations and oil grooves, the company states. A comprehensive report on other cold forming methods was presented in *AUTOMOTIVE INDUSTRIES* for April 15, page 34.



Splines formed by the Roto-Flo process in an average of $3\frac{1}{2}$ seconds forming time. The splined shafts range from $\frac{7}{8}$ in. to $1\frac{1}{4}$ in. outside diam. Splines range up to $1\frac{1}{4}$ in. in length. Note helical splines at left center and straight splines at top center are formed adjacent to protruding shoulders.

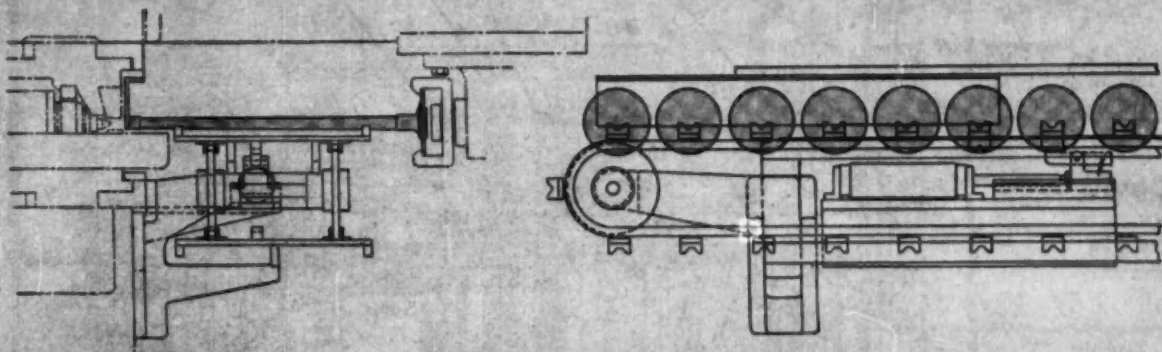
The MTC machines, which are being made in three sizes, have been named the Roto-Flo spline rollers. An illustrated description will be found in the New Production Equipment Department of this issue.

Rolling of the splines (see illustration) takes place between two forming racks of special design, pressures and speeds also being important factors in this new metal-working process. The forming racks are designed to press deeper and deeper into the shaft as they roll it until full depth is reached, then a few additional turns are made at full depth. Racks are high carbon, high chrome steel and their teeth are ground on a special Michigan Tool machine to provide extreme accuracy in spacing, pressure angle, helix angles, etc.

Among the advantages claimed for the rolled splines are high accuracy, excellent surface finish and high tooth strength as the actual flow of the metal conforms to the contour at the root of the tooth. Teeth can be formed up to a protruding shoulder without a recess. In production there is no chip removal problem, there are less machine operations, and the complete cycle is unusually fast.

Indicative of production time advantages is the following case cited by Michigan Tool engineers. Splines of 1.250 in. length were formed on a 1.125 in. diam shaft in three seconds. The return stroke, with the machine empty, took two seconds. Automatic handling of parts was less than four seconds. MTC states that the complete cycle for many parts would be less than 10 seconds.

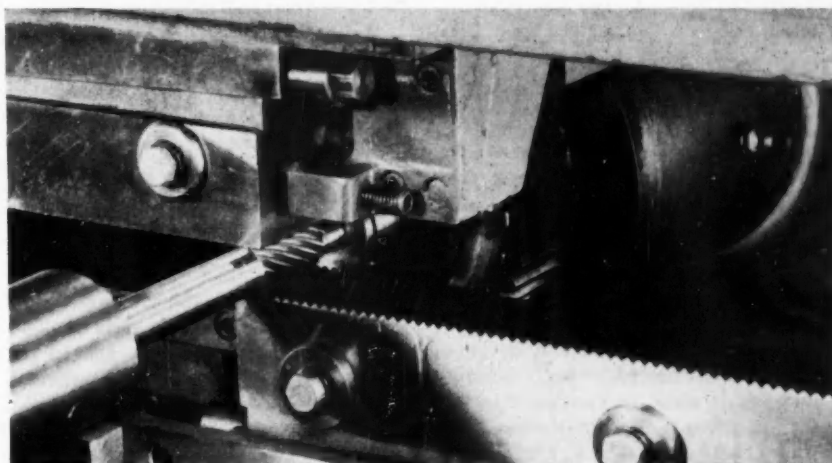
The above part was rolled from SAE 1037 steel ranging in hardness from annealed to 41 Rockwell "C," with the finish obtained



Special automatic conveyor designed to automatically load axle shafts into a Roto-Flo spline roller.

being three to six micro-inches and the accuracy within 0.0008 in. variation from part to part over pins.

For high volume production special automatic loading and unloading equipment has been designed to be used with Roto-Flo spline rolling machines. One piece of such equipment, an automatic conveyor for axle shafts, is illustrated here with a line drawing. The working stroke is held up automatically until the part to be splined is properly located between the head and tailstock and the operator's hands are out of danger. In volume production an automatic coolant system is installed for cooling the forming racks and splines. High tool life



At the end of the stroke rolling helical splines between special forming racks.

is to be expected from the forming racks, according to the manufacturer, since all stresses are compressive and not in shear as with cutting tools.



Kyes Rejoins General Motors With Increased Authority

The wide speculation about the ultimate destination of Roger M. Kyes, who left his position as Deputy Secretary of Defense May 1, ended with the recent announcement that he would rejoin General Motors Corp., which he left 18 months ago for the Government job. Kyes returns to GM in a bigger role than he had when he left the corporation.

In addition to being named group

executive in charge of the GMC Truck & Coach Div. and the Dayton and Household Appliance Divs., Kyes has been elected to the board of directors for the first time. He will also serve on the operations policy and administration committees. Prior to leaving GM in January, 1953, Kyes was a GM vice-president and general manager of the GMC Truck & Coach Div.

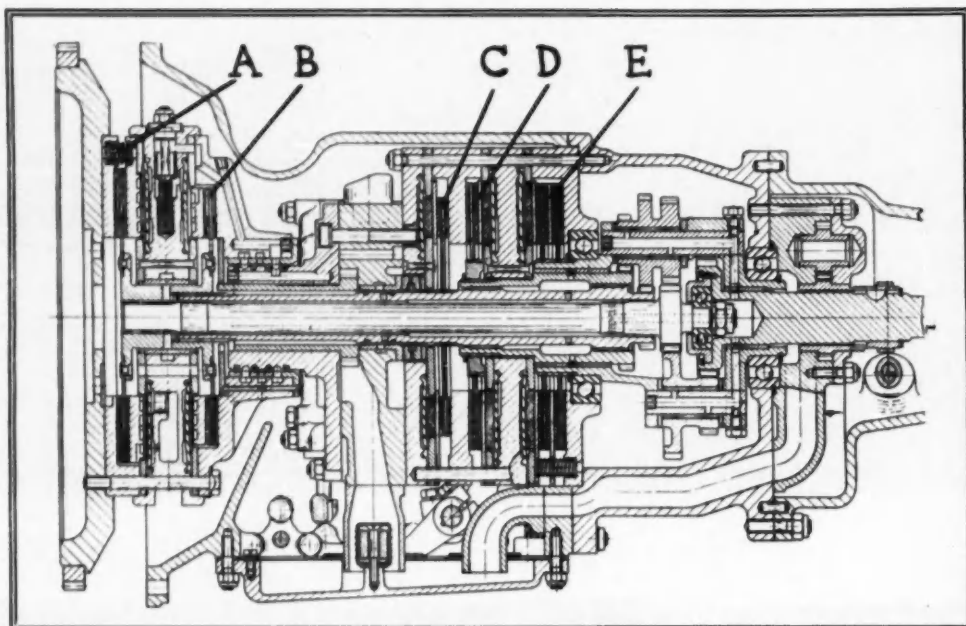
Joining Kyes on the Directorate are Ivan L. Wiles, general manager of the Buick Motor Div., and Thomas H. Keating, general manager of the

Chevrolet Motor Div. The two were also named to the operations policy committee. Wiles and Keating will continue in their present divisional assignments.

Edward R. Godfrey, who has been a vice-president and group executive in charge of the Dayton and Household Appliance Divs., will serve as a special assistant to Harlow H. Curtrice, GM president. He will continue as a vice-president, member of the board of directors and of the operations and administration committees.

By
David
Scott

Longitudinal section of the Hobbs automatic transmission



New Automatic Transmission Developed

LONDON, ENGLAND

AUTOMATIC transmissions on popular-priced British cars are expected to be a highlight of the Earls Court motor show in London this October. Development of these units by Hobbs Transmission, Ltd., Leamington Spa, England, has advanced to the point where several U.K. manufacturers have become seriously interested in their application and may be offering them on their 1955 models.

The Hobbs transmission is said to be well suited to low- and medium-powered cars, since the use of disk clutches provides a mechanical efficiency equal to that of a conventional gearbox. In addition, the extensive use of light alloy castings prevents an increase in total weight. It is also claimed that the transmission will not add appreciably to the overall cost of the car.

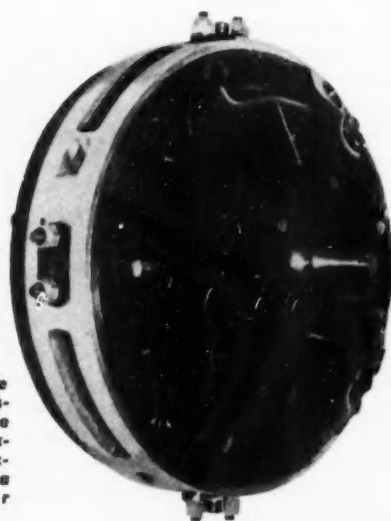
Two-pedal operation is controlled by a shifting quadrant on the steering column. Positions are reverse, neutral, first, second, third and automatic. With the gear lever in automatic, upshifts at full power take place automatically at preselected engine speeds.

A kickdown arrangement on the throttle pedal causes a downshift to the next lower gear for acceleration or hill climbing. Complete manual override is provided for engine braking, rocking, or whenever desired.

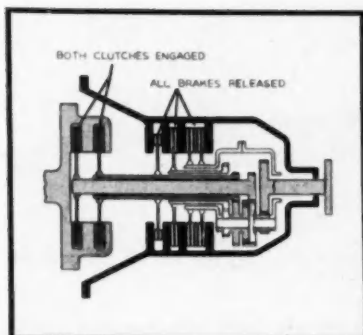
The transmission consists of a pair of hydraulically-operated disk clutches, one compound planetary gear train with four sun wheels, three disk brakes similar

to the clutches, and finally a hydraulic control unit.

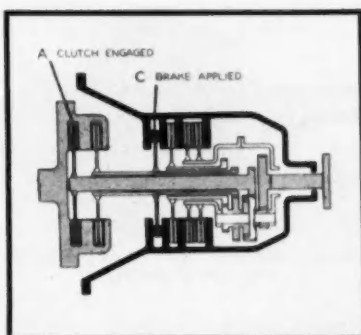
Sun wheels are in constant mesh with the two sets of pinions geared together and carried on the cage. The rear sun wheel is fixed to the output shaft, and the cage to the third (E, in the sectional view) brake. The other three sun wheels are mounted on individual concentric shafts which carry the first (A) clutch, second (B) clutch and first (C) brake, and second (D) brake.



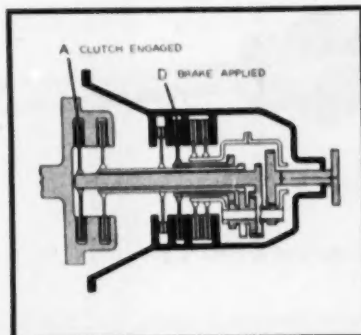
Clutch unit of the transmission. Pressure against the two plates is exerted hydraulically through a flexible annular diaphragm.



High



Third



Second

Power Paths Through Transmission Illustrated

Four forward speeds and reverse are available, and gear ratios are selected by a combination of clutch and brake engagements. In first and reverse, the cage is held stationary and the planetary pinions rotate at less than engine speed. In second and third, the cage is released and rotates slowly while the pinions turn at reduced speed. For top gear

operation, the cage with fixed pinions rotates at engine speed, giving direct drive.

The two clutches, bolted to the flywheel, are built as individual units. Each uses a single friction disk splined on its respective coaxial shaft. Engagement is effected by a synthetic rubber-impregnated diaphragm retained by rings at its inner and outer diameter.

When expanded by internal hydraulic pressure, the diaphragm bears against a pressure plate (through an insulating ring) which contacts the clutch lining. Springs retract the plate when oil pressure in the annular space drops.

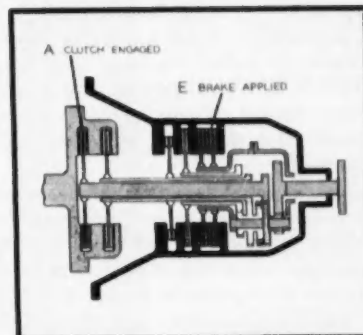
The three brake units, mounted rigidly on the transmission housing, are of the same basic construction. Their disks, however (which are also splined on sleeved shafts), vary in lining area according to the torque loads required of them.

The first (C) brake, used only in third gear, has a smaller diameter disk. The second (D) brake disk, engaged in second gear, is standard. Twin-plate construction is used for the third (E) brake since this is applied in first and reverse gears. This design permits a reduction in brake diameter and hence in size of the transmission.

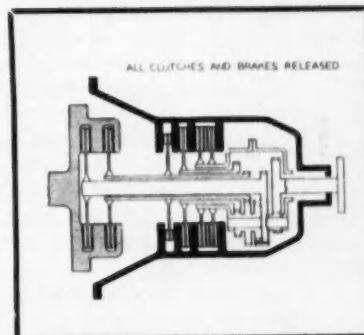
The hydraulic unit, mounted on the stationary brake assembly, consists of an inlet pump driven from the clutch unit, governor valve, kickdown valve, manually-controlled selector valve, and two relief valves.

The governor valve is a sliding cylinder, end-fed from the inlet pump, with oil escape holes in its side wall. The position of the cylinder in its bore, and therefore of its holes in relation to oil channels cast in the body of the unit along the bore, is determined by the pressure of oil delivered.

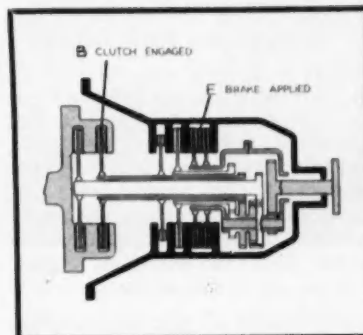
At idling speed, oil pressure is not sufficient to move the valve. Thus there is no release of oil to the diaphragms and the transmission remains in neutral. As oil pressure increases with engine speed, the resultant



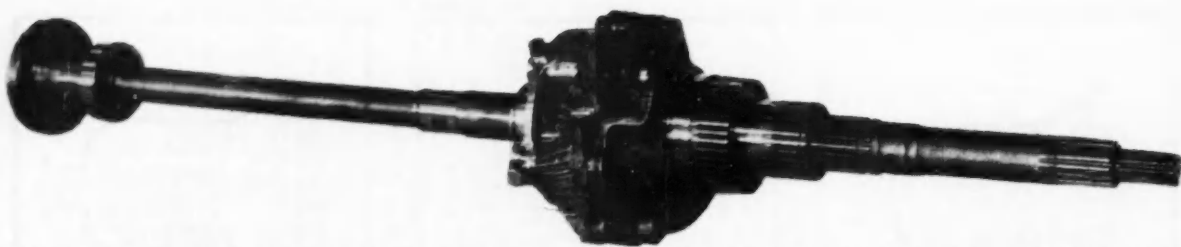
First



Neutral



Reverse



Compound planetary gear train. The two splines at extreme right carry clutch disks; brake disks are splined to other three concentric shafts.

valve movement opens and closes appropriate ports, and upshifts at preselected speeds are made through the gear range. Oil to the clutch unit is carried through a rotating feed journal.

Downshifts occur as engine speed is reduced. The kickdown valve, actuated by fully depressing the throttle pedal, introduces larger jets in the pump delivery circuit. These increase the rate of oil flow and hence raise the speed at which upward gear changes are made.

The manual selector valve consists of a separate cylinder with oil holes. Its location in its bore is controlled by the lever on the shifting quadrant. In all positions other than "automatic" it overrides the governor valve and determines the oil routing.

Rapid engagement and disengagement of the two clutches are effected by special oil release valves positioned radially in the body of each unit. In the "trafficking valve," inward oil pressure is countered by outward centrifugal force. When the engine is idling, the sliding piston exposes an exhaust duct which relieves the pressure against the clutch-actuating diaphragm.

As engine and clutch rotation speed is increased, the valve slide is thrust outwards in its bore with a force greater than that of the built-up oil pressure. This movement seals off the exhaust duct and the full pressure of the oil is directed to the annular space behind the diaphragm.

A second valve, operating on a similar principle,

hastens the exhaust of oil from the annular space when the clutch is disengaged. Applied oil pressure holds down the sliding valve in its radial bore, but when this is cut off the valve moves outward and uncovers an exhaust port and duct. Evacuation of oil from the actuating chamber into the clutch housing is then accelerated by centrifugal force.

A rear pump unit driven from the output shaft supplies oil pressure for the power shift mechanism when the engine is not running and the vehicle is coasting or being towed.

The entire transmission is at rest when the vehicle is stationary, and the cage rotates as a fixed unit in high gear.

Clutch wear is said to be virtually eliminated, since linings are lubricated with heat-dissipating oil. Further advantages claimed are that gear changes may be made at any engine speed, and that there is constant traction during both the manual and automatic shifts.

It is understood that this transmission for cars will be made in four sizes, ranging from 1½ liter to 4½ liter engine capacities. When designs have been fixed, it is likely that quantity production will be undertaken by automobile manufacturers under license. Hobbs has also developed four- and five-speed automatic units for commercial vehicles, heavy construction equipment and tanks. A number of these transmissions are now being installed in a fleet of passenger buses operating in the Birmingham area.

Electrical Modernization Westinghouse Show Theme

New York City was the site selected by Westinghouse Electric Corp. for one staging last month of its new and unusual traveling sales show. Entitled "Chain Reaction," the road show employs the novel technique of presenting colored movies and slides simultaneously on a panoramic screen with two-directional sound, plus the use of live actors.

In brief, the presentation puts over two ideas. First, it establishes a yardstick that can be used in measuring the degree of obsolescence of electrical distribution systems in factory and office buildings. Second, it dramatizes the benefits accruing from a planned power distribution system

and the resulting "chain reaction" effect on other businesses when the decision to modernize is made.

The show is jointly sponsored by Westinghouse, its distributors, and the electrical contractors. It will be presented to factory and office building owners and managers in nearly 100 cities across the nation this year.

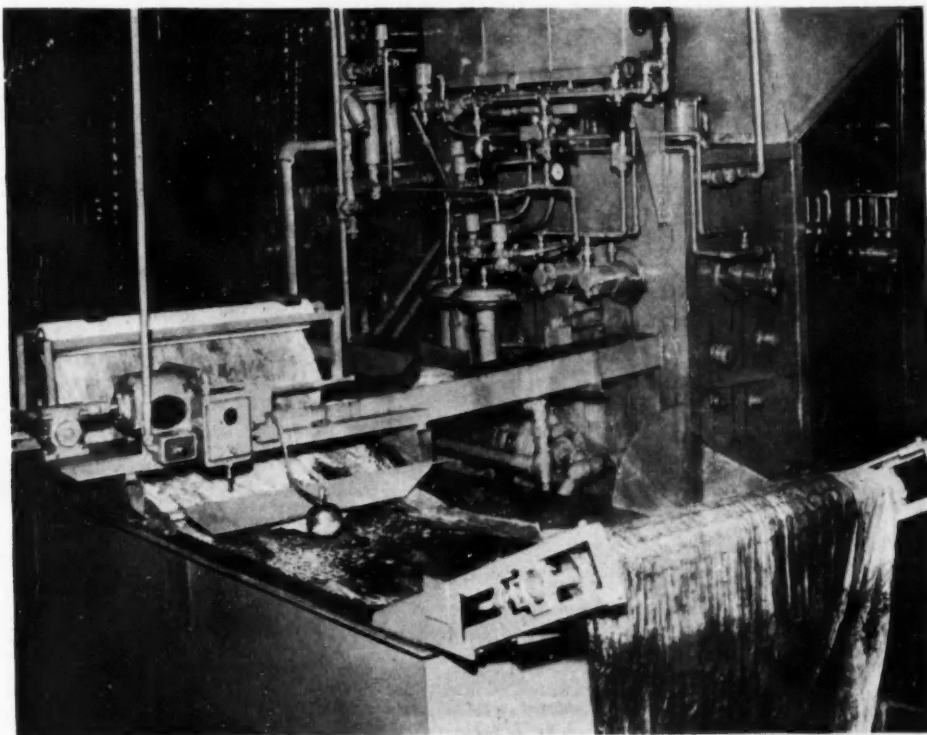
Gemmer Official Sees Brazil As Promising Vehicle Market

Appreciable increases in the production and sales of automobiles and trucks in Brazil within the next decade should create a respectable market for U. S. vehicle manufacturers. This is the opinion of Frederick M. Hammond, president and treasurer of Gemmer Manufacturing Co., who re-

cently returned from a one-month study of Brazil.

Indications and forecasts are, Mr. Hammond reported, that production of trucks in Brazil will reach nearly 120,000 units per year by the middle of the 1960's as new undeveloped areas are opened. Similarly, a smaller, but notable increase in the demand for automobiles will result in production figures of about 70,000 yearly by the same period, he said. Present production of trucks is about 4000 and automobiles about 9000 per year.

Mr. Hammond revealed that his firm is now negotiating with a large Brazilian firm as a licensee for the manufacture of Gemmer steering products. The company now has five licensees manufacturing its steering devices in foreign countries.



LEFT — Rear view of the cylinder block oil gallery hole washer used for cleaning Silver Diamond engine oil holes. The cleaning solution used is filtered 100 per cent before being recirculated.

BELOW—A large demagnetizer is built around the camshaft and camshaft conveyor. The conveyor, which leads to the washer and final inspection, cannot be started until the demagnetizer is switched on.

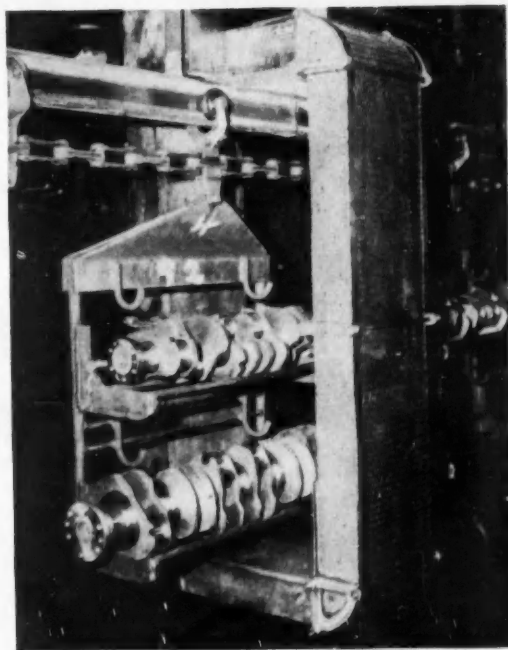
Quality Control at IHC

QUALITY control at the Indianapolis Works of International Harvester Co. extends wide and deep to assure specification performance of truck engines, and freedom from dirt in the oil lines and operating parts.

A clean engine is a major goal. Although all parts are given the usual chemical washes in the machine shop, the cylinder block is subjected to a special wash at the assembly line to assure dirt-free oil lines. To this end the block goes through a special washer where the gallery is flushed with a hot compound, flushed with steam, and finally dried with an air blast. This machine is fitted with a Delpark filter attachment, similar to those used on machine tools, to continuously filter the compound.

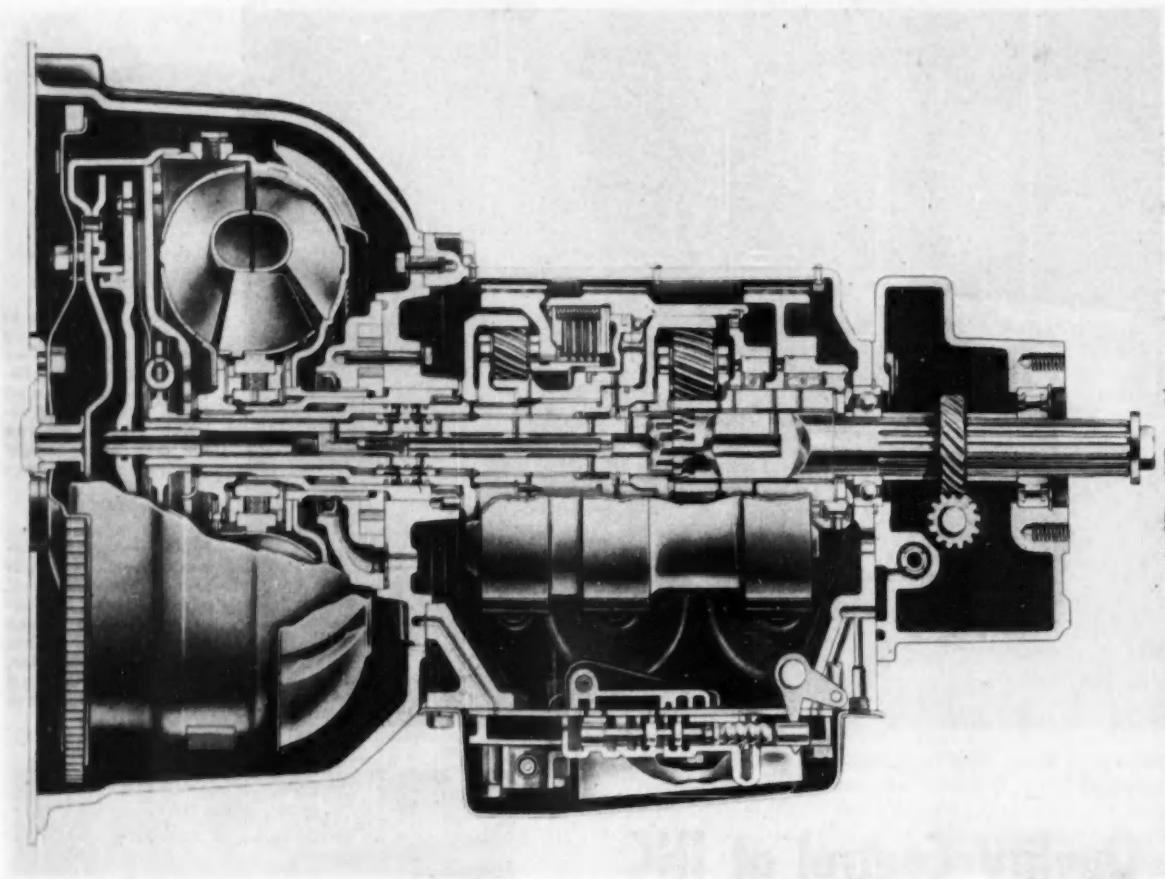
They have found that several parts, such as connecting rods and crankshafts, that are subjected to a variety of grinding and honing operations tend to become magnetized, and carry some fine metallic particles that adhere tightly even through the washers. To eliminate this source of dirt, the company has installed a large demagnetizer on each of these lines, directly ahead of the washer. As a further precaution the demagnetizer circuit is so connected with the conveyor that the latter will be stopped in the event the demagnetizer becomes inoperative.

As is common practice in most engine plants, engines



coming off the assembly line are subjected 100 per cent to a block test for adjustment and running inspection, in this case for 35 minutes. Before the engine is test run, it is flushed for about 15 minutes with hot oil under a pressure of 55 psi, heating the engine to operating

(Turn to page 114, please)



Longitudinal sectional and cutaway view of the Metro-Matic transmission which is offered as optional equipment on some of the trucks made by the motor truck division of International Harvester Co.

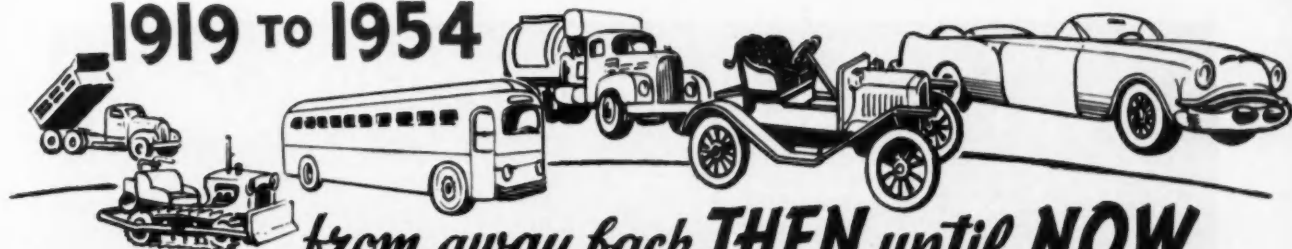
New Automatic Transmission for International Trucks

A NEW three-speed, completely automatic transmission, called "Metro-Matic," has been made available as optional equipment in International RM-120 and RM-150 Series trucks with Metro (R) and RA-12 and RA-140 Series models with Metroette bodies.

Features of the new transmission include a torque converter coupling which multiplies engine torque up to 2.16 to 1; a completely automatic, hydraulically controlled, planetary-type, three-speed transmission with constant-mesh helical gears; and a direct drive that locks out the converter and allows engine torque directly to the rear axle for fuel economy in high gear.

With the drive selector lever on the steering column in normal drive position, the driver controls the full range of speeds with only accelerator or brake pedal. This includes down-shifting for rapid acceleration when required. For situations requiring extra power or down grade braking, the lever can be shifted to low position, locking the transmission in first gear. Should mud or other surface conditions require it, the driver can rock the vehicle forward and backward by moving the shift lever alternately between low and reverse. The ignition-key starting system operates only when the selector lever is at neutral.

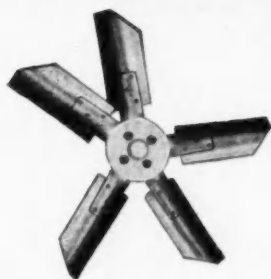
1919 TO 1954



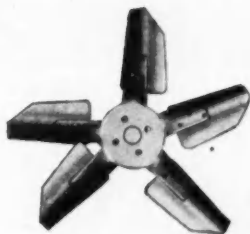
from away back THEN until NOW

SCHWITZER-CUMMINS

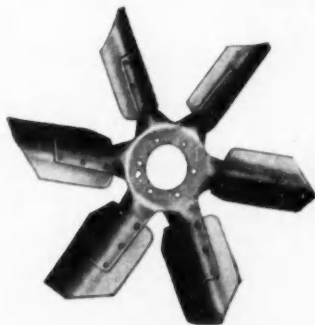
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Heavy Duty Truck Fan



Extra Cooling
Passenger Car Fan



Heavy Duty Bus Fan

**Shown
Here**

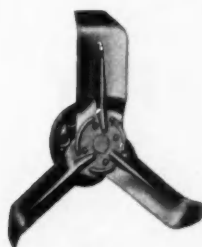
are samples of many fine cooling fans with individual characteristics compounded for best performance of the engine and engineered, developed and manufactured in Schwitzer-Cummins plants and laboratories for blue-ribbon engines in the automotive world.

The founders of Schwitzer-Cummins Company were consultants on engine cooling in the pioneering days of the automobile. Then, with the formation of the company 35 years ago, became active as manufacturers of cooling fans and water pumps and qualified immediately as major suppliers to the then young automotive industry.

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... IF IT'S A HIGH PRODUCTION PROBLEM ...

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get a Transfer

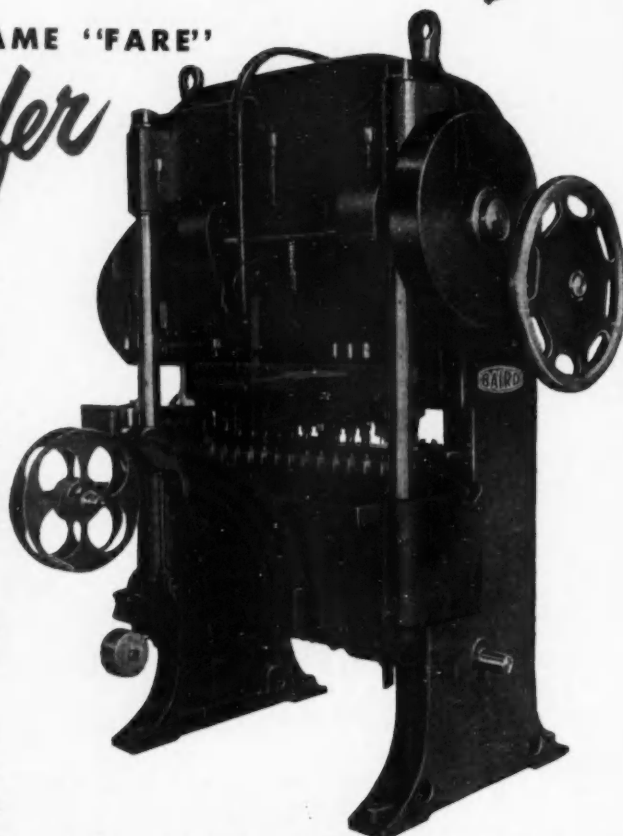
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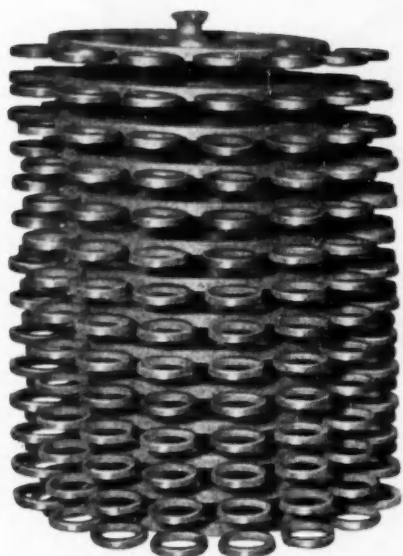
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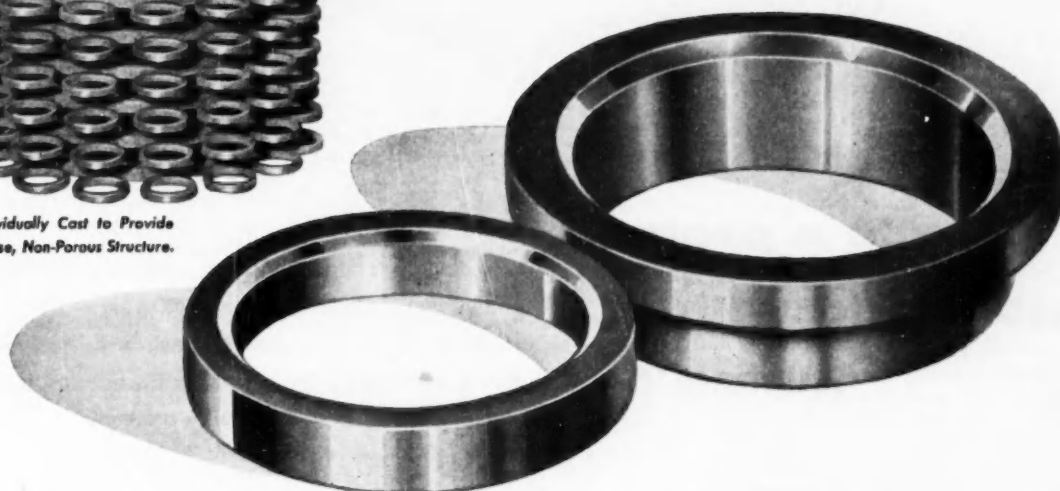
GBA54

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Japanese Machine Tools

A very interesting report has been recently received from the Industrial Bank of Japan, Ltd., dealing with the Japanese machine tool industry. From this report we find that 97 per cent of the machines imported by Japan have a service age of over 10 years with only 12 per cent still maintaining the performance possessed at the time of installation. Of all Japanese machine tools 81.4 per cent are over 10 years of age. Japanese machine tools on the average cost about 30 per cent the price of imported tools on a ton basis.

For the purpose of technical improvements, efforts are being made, besides the modernization of equipment, to improve the quality of basic materials, to develop new designs and to shift from emphasis on the manufacture of universal machines to that of specialized machines. Though

gradual results are being realized, the present level still is considerably behind the international level.

In Table I are shown the types of machine tools required for industrial rationalization. It will be noted that most of them are specialized machines. Naturally, experimental production by the machine tool industry is centered around these specialized machine tools.

As to the size of the demand for rationalization purposes, it may be pointed out that the effective demand for machine tools is not so great (1) because of the low profit return of the machinery industries, which are the largest users of machine tools, (2) because of the relatively small amount of investment of fiscal funds in these industries in view of the preference given to the key industries, such as electric power, shipping, iron and steel and coal industries and (3) because of the subordi-

Japanese Machine Tool Industry Must Produce High-Performance Equipment If It Is to Dispense With Need for Importation.

TABLE II

Japanese Demand for and Supply of Machine Tools in 1952

Kind	Domestic Output Metric tons	Imports Metric tons	Exports Metric tons
Lathes	1,650	118	489
Milling machines	358	12	142
Boring machines	175	16	52
Drilling machines	1,189	106	97
Gear-cutting machines	237	37	6
Grinding machines	960	467	91
Sub-total	4,569	758	877
Others	1,244	117	266
Total	5,813	875	1,143

Source: Japanese Ministry of International Trade & Industry.

TABLE I
MAJOR MACHINE TOOLS
REQUIRING MODERNIZATION

Industry	Machine Tools Requiring Modernization
Bearing.....	Grinding machines for manufacturing internal and external rings, balls and rollers; automatic lathes
Tools.....	Grinding machines for super-hard tools and for ordinary tools
Sewing machine.....	Specialized machine tools for the manufacture of parts
Shipbuilding.....	Multiple-edge lathes, tracer controlled dual-purpose lathes and other automatic machine tools
Automobile.....	Gear-cutting machines, automatic lathes, milling machines, crank-shaft lathes and broaching machines
Wire communications equipment	Automatic lathes, multiple spindle drilling machines and oil-pressurized broaching machines
Wireless communications equipment	Automatic machine tools

Source: Japanese Technical Board.

nation of machine tools to motive power, transportation and heat treatment equipment in the spending of equipment funds.

In the case of the automobile and heavy electrical equipment industries, which have indicated brisk production to fill off-shore procurements and the demand from electric power development companies, it appears that considerable improvement of equipment has been effected. Taking the automobile industry as an example, there is a significant renovation of machine tools and new installation of gear-cutting machines, followed by grinding and broaching machines.

In Table II is shown the demand for and supply of machine tools by types expressed in tonnage. With the exception of gear-cutters and grinders, there is a high percentage of domestic self-sufficiency in machine tools.

Quantitatively, therefore, the extent of imports is not so much as to constitute an oppressive factor and it appears that any increase in demand can be met by raising the operating rate and improving the level of production. However, in view of the recent tendency to stress performance (quality of product) whereby high-

performance machine tools far superior to old models is demanded, mere quantitative self-sufficiency does not constitute a factor warranting optimism. As a matter of fact, analysis of the demand and supply in 1952 on a value basis reveals that the percentage of dependence on imports was over 40 per cent.

In view of this situation, it is essential for the promotion of the machine tool industry to cultivate export markets, foster the domestic production of high-performance products with a view to dispensing with the need for their importation from abroad, and to expand the domestic market. And it is to this end that efforts are now being directed by the machine tool industry.

Machine Tool Shipments Drop Slightly in Quarter

In spite of a sharp drop in machine tool business during the first two months of this year, reports for the first quarter show that shipments were down only 13 per cent, amounting to \$328 million, compared with the like period a year ago. Although shipments of cutting tools in the quarter dropped to \$260 million from \$315 last year, forming and shaping tools accounted for \$67.4 million compared with \$56 million in the first three months of 1953.

Machine tool orders, which have been sagging since January, dipped from \$50 million in March to \$42 million in April, and shipments declined from \$95 million to approximately \$89 million.

Canadian Fair

Equipment new to North America made its appearance for the first time at the Canadian International Trade Fair by manufacturers of a number of countries. The machinery and machine tools section of the CITF, held at Toronto last month, was the largest part of the exhibition, with companies from Canada, United States, Great Britain, West Germany, Switzerland, Sweden, Holland, Japan, Belgium, and Italy represented.

A Canadian exhibitor, Bradley Machine Co. Ltd., Brantford, Ont., showed a Canadian-made hydraulic press brake of all steel welded construction. It is the first such press brake made in Canada, and makers claim it is one of the few hydraulic press brakes made anywhere.

From Burgsmüller & Sons, Kreien- sen, West Germany, came a new thread and worm cutting attachment,

which the maker claims cuts production time by 90 per cent. It is represented in the United States.

A Swedish firm, Sandvik Steel Co., Ltd., Sandvik, Sweden, featured a combination milling cutter, which combines nine cutters in one. Cutting blades can be quickly replaced on this cutter, without taking the entire cutting head apart. Equipment is now available in Canada and the United States.

A Swiss fine-wire automatic winding machine for winding small transformers and ignition equipment coils was shown for the first time by the Canadian and American distributors (Associated American Trading Co., 8010 Empire State Bldg., New York).

Western Tool Engineers Plan Exhibit Next Year

March 14-18 are the dates set for the first Western Industrial Exposition of the American Society of Tool Engineers, to be held in the Shrine

hardness that should be considered. In the first place, stress concentration has a big effect on the relation of strength to hardness. Just roughly, the following relations seem to hold:

Amount of Effective Stress Concentration Factor	Endurance Limit Strength in Unidirectional Loading
1.0	About half of ultimate strength
2.0	A function of ultimate strength but not proportional.
3.0	Endurance limit just about constant. Ultimate strength has very little effect.

Gear teeth with full radius fillets have photo-elastic stress concentration factors in the order of 1.5 to 1.9. Things like scratches, tears, corrosion or inclusions may make the effective stress concentration factor come as high as 2.5 or 3.0.

The gain in strength in hardening gear teeth is not as much as might be expected and in some cases there will be no gain at all in hardening gear teeth.

It is generally agreed among metallurgists that the ultimate strength of steel depends almost entirely on the hardness obtained and that the composition is not important. In other

Auditorium and Exposition Hall in Los Angeles. The exposition will run concurrently with the 1955 annual meeting of the ASTE.

More than 70,000 sq ft of space will be provided for about 400 companies which are expected to exhibit their equipment, materials, processes and supplies. The event will be staged in recognition of the rapid growth of western industry, which has doubled its production between 1947 and 1952.

Cone Overseas

Foreign Operations Administration is insuring an investment by an American manufacturer of multi-spindle automatic screw machines in a new British subsidiary.

FOA is guaranteeing convertibility of receipts from the investment of the Cone Automatic Machine Co., Inc., Windsor, Vt., to a maximum of \$262,500—175 per cent of the dollar value of the initial \$150,000 investment—for 10 years.

AGMA Annual Meeting

(Continued from page 65)

words, alloy steels are no stronger than straight carbon steels if both can be heat treated to the same hardness.

This situation does not apply to the fatigue strength of gear teeth. There has been as much as a two to one difference in strength in two alloy steels each heat treated by the same method to the same hardness! In some cases where two steels show widely different strengths when heat treated the same way, it is possible to use different treatments and make the strength come out the same for the same hardness. This situation makes it hard to write a standard on allowable gear tooth stresses. In the past, allowable stresses have been made or less proportional to hardness. Considering the fact that the amount of the stress concentration factor and the kind of heat treatment used on a particular composition drastically alter the relation of hardness to strength, it becomes difficult to decide how to write a standard on allowable gear tooth strength. At the moment, the only solution seems to be to assume that those who use high hardness steel will know enough about gear making to get some good out of the high hardness and therefore allow them to use higher design stresses.

NEW EQUIPMENT

PLANT • PRODUCTION



FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Broaches Turbine Buckets

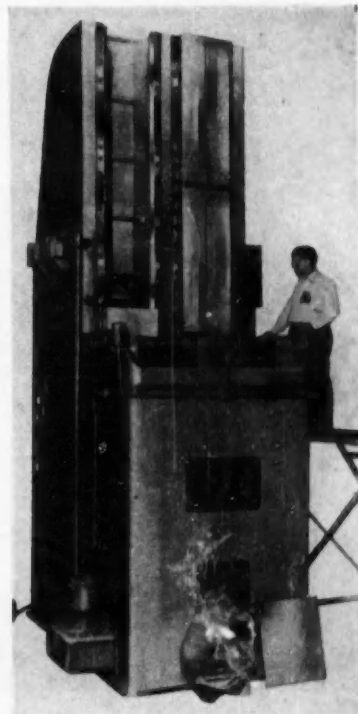
A double-ram vertical broaching machine with electro-mechanical drive is primarily designed for production broaching of aircraft engine turbine buckets. Variable speeds are easily obtainable through a simple turn of a knob on the side of the machine. The drive is designed around a constant torque variable speed d-c motor, through a double gear box, and using a positive lock between the two rams.

Smoothness of operation and fine finish claimed for the machine, at

high speeds, is due to the 30-ton weight, built-in rigidity, and the electro-mechanical drive. Strokes are available from 70 to 100 in.

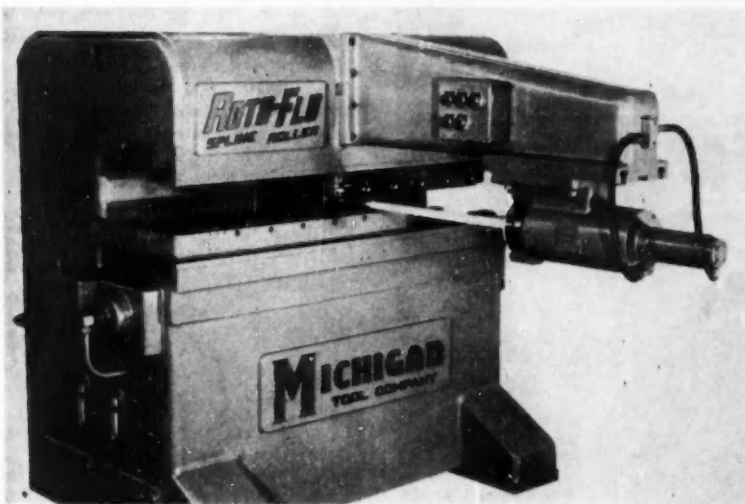
An exclusive tip-down type work table is a special feature. The machine is equipped with hydraulic units for fixture, table, and clamps; it has an automatic lubricating system, with machine shut-off if the oil level gets too low. *Lapointe Machine Tool Co.*

Circle 56 on page 89 for more data



Lapointe double-ram broach

Cold Rolls Splines and Serrations



Basic components of the Roto-Flo machine for cold rolling splines, besides the rack-type forming tools, are two slides and an extremely heavy "C" shaped machine frame. Operation is described elsewhere in this issue. The two slides, holding the forming racks, are mounted one above the other. The slides are geared together with master racks (not the tool racks) and a connecting gear. All stresses are compressive. The lower rack is the prime mover and is hydraulic powered. Tool racks are adjustable toward the part center to obtain proper size, and are also adjustable endwise to gain correct relationship with the part axis. Safety interlock system will not permit the forming racks to return until the workpiece has been removed. Also, the working stroke is held up automatically until the part to be splined is properly located between the head and tailstock and the operator's hands are out of danger. (*Michigan Tool Co.*) A description of this process of cold rolling splines will be found on page 66.

Circle 57 on page 89 for more data

Prevents Tampering

A protective device for hydraulic flow control valves has been introduced. Known as the Cross Flow Control Lock, the unit is designed to prevent unauthorized personnel from tampering with the hydraulic feed setting on production machine tools. This is said to assure the maintenance of constant correct feed rates, stop unnecessary shutdowns, save tool sharpening, reduce tool breakage, and protect the machine from avoidable abuse.

The Flow Control Lock consists of a mounting plate, sidewalls and a hinged locking cover. After the desired feed has been set, the cover is closed and locked with a key operated barrel-type lock. *The Cross Co.*

Circle 58 on page 89 for more data

(Turn to next page, please)

NEW

EQUIPMENT

PLANT • PRODUCTION

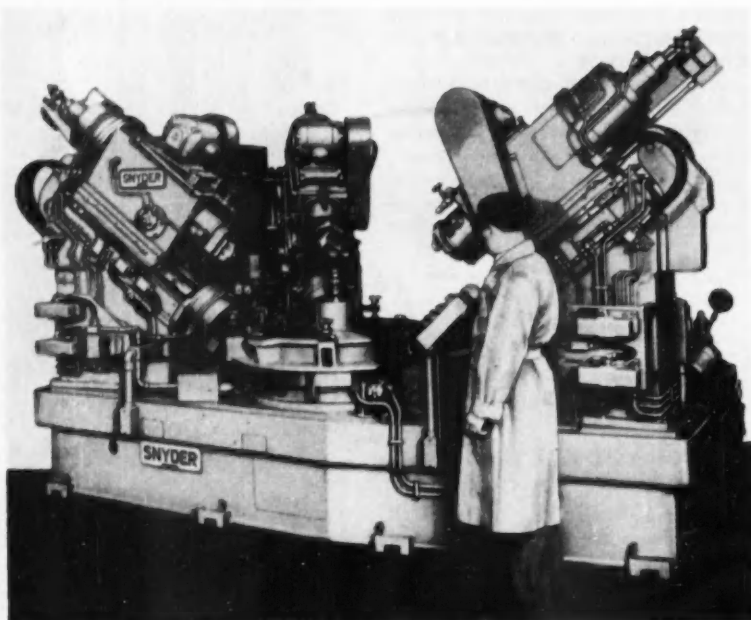


For additional information, please use postage-free reply card on page 89

Automatic Machine for Diffuser Cones

A special machine combines speed, precision and automation in the processing of aircraft diffuser cones. The work-piece is a hollow, truncated,

stainless steel cone approximately 17 in. high in the center and 40 in. in diameter at the large dimension. Around the outer inclined wall are



Snyder machine for processing diffuser cones.



Centerless Grinder

The Model No. 12½ heavy duty centerless grinder is available with automatic loaders and automatic cycles for production by either the infeed or throughfeed method. Maximum work diameter is six in., wheel width is 10 in. Wheel spindle is pressure lubricated. (Landis Tool Co.)

Circle 60 on page 89 for more data

Positioning Table

An automatic positioning table for use with radial drills for the first time is available as a separate unit.

The positioner gives exact reproduction of precision drilled, bored, tapped and reamed parts—without jigs, without setting stop adjustments. Once two simple duplicating bars are prepared, positioning of work is done automatically at the touch of a button, accurate to ± 0.0001 in. Fosdick Machine Tool Co.

Circle 61 on page 89 for more data

located a number of irregularly spaced bosses which are machined.

Two of three boring and facing units are tooled to bore through a boss and then feed radially to face off the same boss. The third unit positions the head and causes radial feed of tool to face only. The slow feed rates necessitated by single point tooling are accurately controlled by the use of 12-in. diam cylinders from which the hydraulic fluid is accurately metered. Radial actuation of facing tools is accomplished by separate hydraulic cylinders. The heads are arranged around the index table so that all bosses are machined with a minimum number of indexes.

The part is loaded into a fixture which clamps at several places on the flange on the large outer rim. The inside of the part is supported by an expanding arbor. The fixture is mounted concentrically on a five-station index table which is keyed for five unequally spaced indexes. The table is driven by a fluid motor. After the part has been loaded and clamped manually, the work-cycle is automatic and is as follows: Two units operate and bore and face two bosses; table automatically indexes and again two units operate and bore and face two bosses; table indexes three more times and, each time, a single unit operates and a facing operation is performed. The fifth index brings the table back to original position where the part is unclamped and unloaded.

Heads are provided with adjustable sheaves to permit variation of spindle speeds. Tools are tungsten carbide rotating at 50 fpm with 0.15 in. a minute infeed. Production is one work-piece an hour at 80 per cent efficiency. Snyder Tool & Engineering Co.

Circle 59 on page 89 for more data

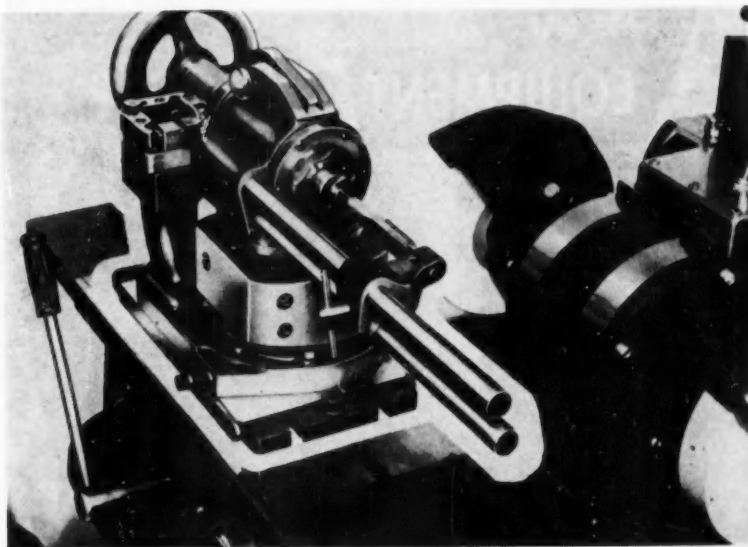
Form Relief Grinder

A universal form relief grinder operates on a new principle and produces axial or radial relief only, or any combination of the two.

Set-up and operation have been simplified to the point that form relief can now be made the standard grind, for most end and side cutting tools. By this method, form relief leaves more metal behind the cutting edge, and cutting edges are produced by grinding from the heel of the blade rather than back from the cutting edge.

The fixture moves on hardened and ground ways operating on preloaded roller bearings. Instead of oscillating and rocking the tool into the wheel, motion is on a plane. The tool moves into the wheel on center for the entire grind, for better control and elimination of vibration.

Activation is by means of fast interchangeable cams. Five selective pivot points on the bell crank, to which the cam follower is attached, enable the operator to relieve varying amounts with any cam of one to 16 impulses. Change of cam and set-up of the fixture for a specific relief is quickly done. The two adjustments



Fixture of the Royal Oak universal form relief grinder.

are machine calibrated and easy to read. No gages are needed and no attachments are required or parts removed. Set-up is made on the grinder.

Circle grinding can be performed

by turning a knurled thumb screw which releases contact of the follower on the cam. *Royal Oak Tool & Machine Co.*

Circle 62 on page 89 for more data

Coolant Pump

A direct connected compact motor driven Rumaco centrifugal pump, Model D-501, is adaptable to various air conditioning installations, including evaporative condensers, and medium size cooling towers requiring up to 40 gpm at 30 ft head. The unit is bronze fitted and will handle water and other liquids without danger of rust or corrosion even where used intermittently and during seasonable idle periods. *Ruthman Machinery Co.*

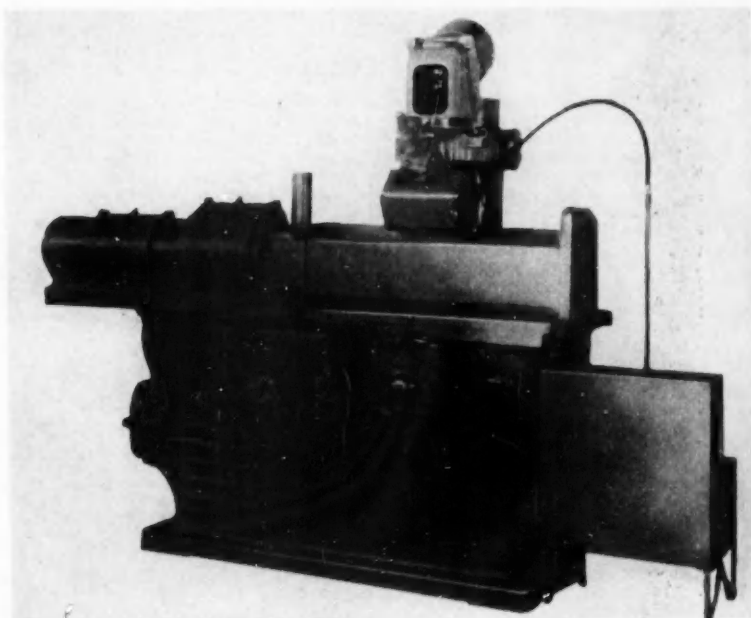
Circle 63 on page 89 for more data

Welding Hose

Addition of a welding hose to the commercial line of the Goodyear Tire & Rubber Co. was announced.

The new product, *Dubl-Flex Welding Hose*, is a molded double line welding hose, consisting of a red line for acetylene and a green line for oxygen, produced in 3/16 and 1/4 in. sizes only. *Goodyear Tire & Rubber Co.*

Circle 64 on page 89 for more data
(Turn to next page, please)



Improved Sharpening Machine

The No. 10-12 hydraulic sharpening machine has been redesigned to accommodate wet grinding of high-speed steel and carbide-tipped hobs and form-relieved cutters. New wheel spindle and work spindle are fully-protected against the effects of coolant. Splash guards and coolant tank and motor are extra equipment which may be ordered for installation on a standard machine. The wheel spindle has also been made more rigid for a finer surface finish on the faces of the flutes. (*Barber-Colman Co.*)

Circle 65 on page 89 for more data

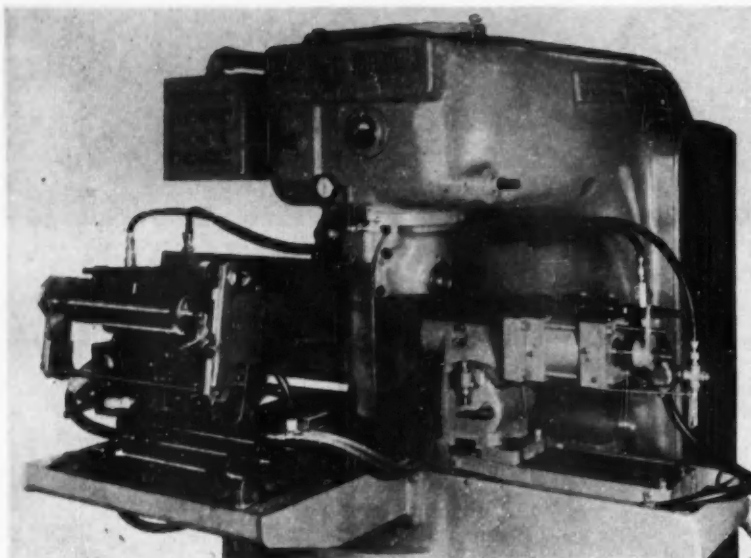
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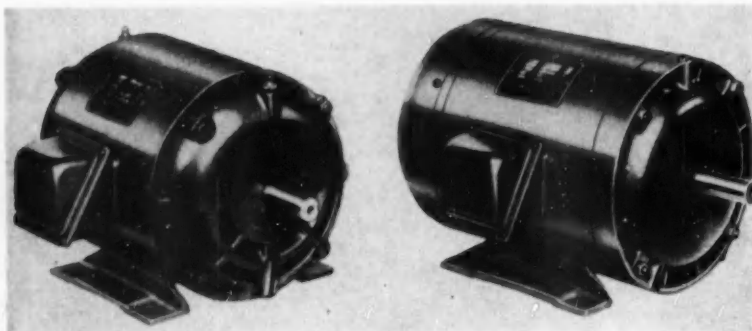
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Gear Loader

This Red Ring automatic loader for handling long-shaft, unsymmetrical gears on standard rotary shaving machines has a built-in gaging device, magazine feed, air-powered loading fingers and a discharge chute that feeds finish-shaved parts to unloading position in front of the operator. Lever-type trip fingers in both input magazine and discharge chute keep the gears from touching. Operation is completely automatic when used in conjunction with a standard rotary gear shaving machine equipped with suitable controls and an air-powered tailstock. (National Broach & Machine Co.)

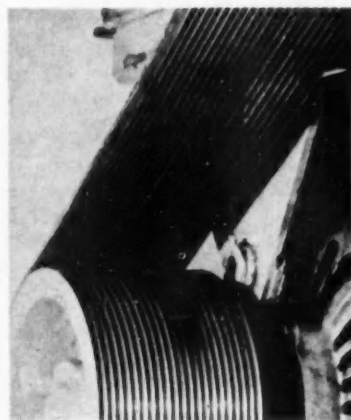
Circle 86 on page 89 for more data



Motor Line to New Standards

A line of Series 100 re-rated polyphase a-c motors in the one to 30 hp class are built to new NEMA frame-size standards. In some models power is double that formerly in frames of the same size. Frames are made of rolled steel to increase winding space, and end plates are of cast iron. Ventilation is improved. First motors offered are open, drip-proof motors, left, and totally enclosed, fan-cooled motors. (Howell Electric Motors Co.)

Circle 87 on page 89 for more data



One-Piece Belt

The Poly-V belt, which is a single, endless rubber belt with a series of parallel V ribs molded lengthwise around the inside circumference, has an uninterrupted high-strength member of synthetic cords across its entire width. The load is distributed equally over the entire driving surface, providing twice the contact area of a comparable multiple V-belt application. (Manhattan Rubber Div., Raybestos-Manhattan, Inc.)

Circle 88 on page 89 for more data

Plastic Metal

A putty-like material consisting of fine steel powders and an extremely strong plastic has just been developed to make permanent and durable drill jigs, fixtures, forming dies and similar products in a fraction of the time previously required and at a fraction of previous costs. Additional uses for Devcon include plug gages, rubber molds, models, prototypes, and for caulking large holes in metal castings.

No heat or pressure is required. After the desired shape has been formed, the material becomes a rigid piece in about two hours.

It has excellent adherence to steel, and has high impact, tensile and compressive strengths. If additional hardness is required, it can be chrome, nickel or copper plated or metallized by conventional methods. Chemical Development Corp.

Circle 89 on page 89 for more data



Drill jig of Devcon.

Large Single Spindle Automatic Chucking Machine

An automatic single spindle chucking machine soon to be available offers features which make it adaptable to production lines with automatic loading equipment and chip conveyors.

The 12-in. Universal Model MC is open for easy access to the chucking zone and to the cam dogs, change gears and toolslide cams. Operation of the chuck and clutches is by air. The two side slides and the five turret slides are independently operated, so that forming cuts may be continued while indexing turret positions.

Wider speed and feed ranges with speed changes automatically controlled during the machine cycle give this chucker versatility in combining carbide and high speed tooling as well as threading in the same setup. Travel of each cross slide is $4\frac{1}{2}$ in. Maximum length of turn and bore is eight in. There are 17 overlapping speed ranges with six speeds each, covering 25 to 1478 rpm. Three feed ranges are automatically obtained with each set of gears. Low range (high range is four times heavier) is 0.0037 to 0.0448 in. for the turret slides and 0.0007 to 0.0084 in. for the cross slides. A 25-hp motor is standard, although a 40-hp motor has been used successfully to advantage.

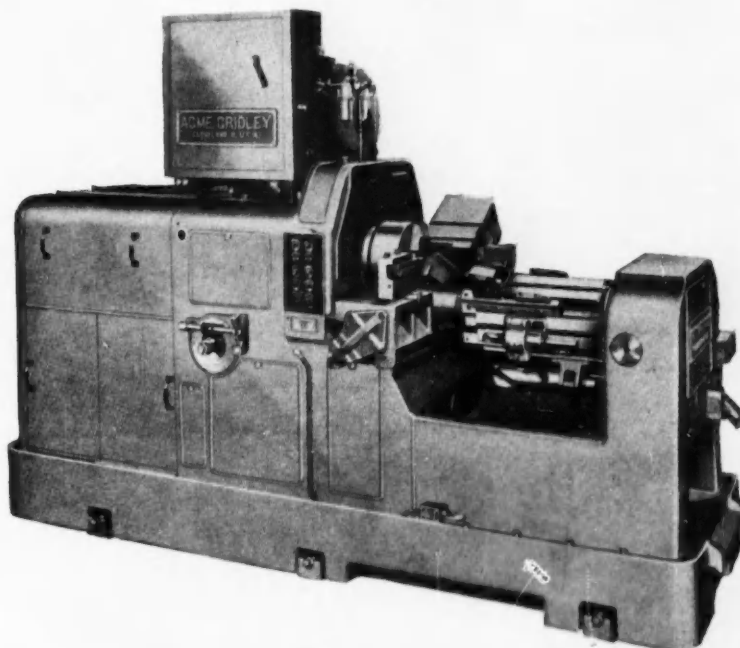
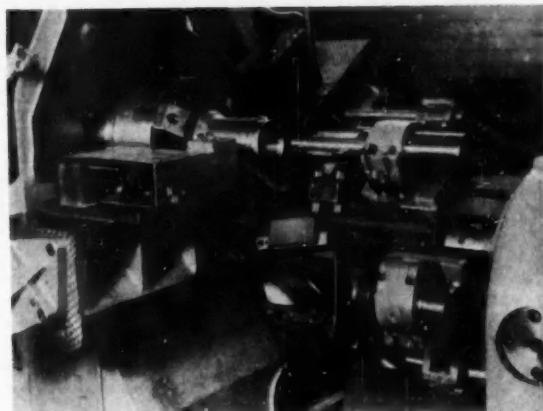
Each of the turret slides and cross slides is independently cammed and controlled by Snap-Lock switches. A large drum at the rear of the headstock has cam lugs bolted on to operate each turret slide. Air operated clamps lock the turret after indexing by Geneva movement in the tailstock.

Idle time movements are accelerated. Total machining time per piece for all operations in the setup is determined by the tolerance and finish required.

Adaptability for additional tooling, including attachments for self-opening threading dies and collapsible taps, permits more operations to be included in a single automatic setup to avoid rehandling the piece. *The National Acme Co.*

Circle 70 on page 89 for more data

Tooling closeup of the Acme - Gridley automatic chucking machine.



The Acme-Gridley Model MC 12-in. single spindle automatic chucking machine.

Shell Mold Resin

Savings of up to 50 per cent in resin content for shell molding is claimed for a process for pre-coating sand with phenolic resins. This process, due to more efficient use of resin, makes possible higher green strength, greater shell mold bond strength, and smoother casting surfaces. The process coats each sand particle with a

thin layer of BRQ-12244 resin, and is said to result in a faster melt, faster flow, and faster bond than conventional resin-sand mixtures, by coating in the molten state. To trigger the final molding reaction, a catalyst is added in an aqueous solution. The coated sand is then dried to a freely pourable state and can be stored for

later use. Laboratory tests show a 25 per cent reduction in dwell time of the coated sand on the hot pattern plate during the forming operation. *Bakelite Co.*

Circle 71 on page 89 for more data

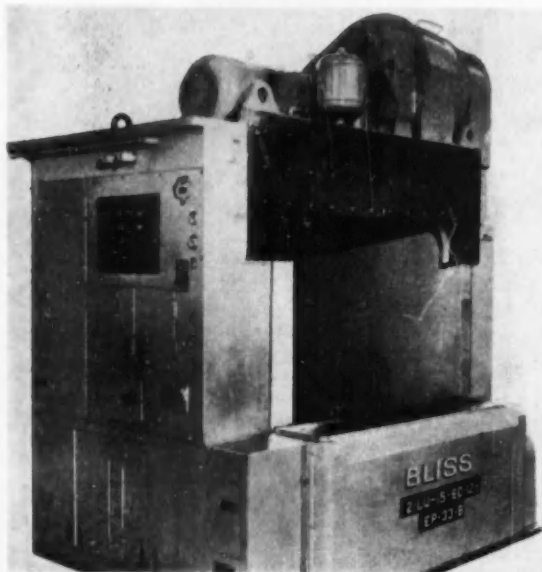
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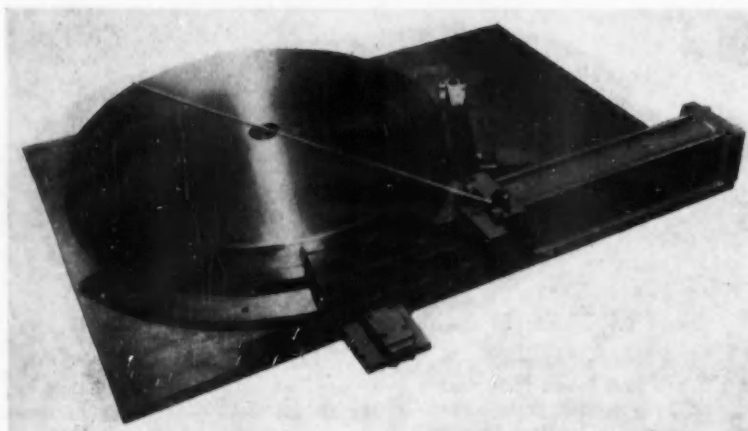
Automatic Welding Press



All piping, controls and wiring are located inside the frame of the 4L series of welding presses. These machines afford greater protection to operating controls while maintaining accessibility. Used for high-speed, automatic assembly of large metal sections, the welding presses are available in four sizes with underdrive and conventional drive arrangements. Beds are 12 in. deep with widths ranging from 42 to 84 in. Strokes are eight and 10 in., or eight and 12 in. (E. W. Bliss Co.)

Circle 72 on page 89 for more data

Self-Contained Index Table



A large outside turning and locking index table, Model No. 48, is unique in that all working mechanism is outside the table itself. Adjustments can be made or working parts may be removed without disturbing the table or disassembling tooling. This model is available in sizes from 20 to 48 in. in diameter with six or more stations, for air or hydraulic operation. (Air-Hydraulics, Inc.)

Circle 73 on page 89 for more data

Gage Cutout

A precision engineered gage cutout gives low cost positive protection against excessive line pressures that damage expensive gages, meters, and instruments. Sensitive response is afforded at pressures as low as 10 psi. Additional advantage is to be found in the corrosive resistant, lightweight aluminum body of the cutouts.

The cutout is available in two models—a low pressure cutout with ranges from 10 to 300 psi and a high pressure cutout with ranges from 100 to 3000 psi. Greer Hydraulics, Inc.

Circle 74 on page 89 for more data

Epoxy Resins

A group of epoxy resins and their hardeners form strong, lightweight products with excellent chemical resistance and electrical properties. C-8 epoxy resins and hardeners are technically known as monomeric, low molecular weight diepoxides. BR-18774 and BR-18795 resins are characterized as rapid hardening, thermosetting resins with 100 per cent reactive components when formulated with their complementary hardeners. Hardeners, BR-18793, BRR-18812, BR-18803, and BR-18807 are aliphatic polyamines specially synthesized to give the new epoxides a wide range of curing speed, viscosity, and pot life. They may also be blended to obtain specific properties in the finished product. Bakelite Co.

Circle 75 on page 89 for more data

Improved Plating Process

An improved nickel sulfamate plating process is said to plate 75 per cent faster, be more versatile, easier to control and produce harder deposits with less brittleness than other sulfamate processes presently available.

The new bath plates up to 0.007 in. of nickel per hour. Operation at current densities of 140 asf make this high speed possible.

Deposits of low internal stress are easily obtained, and a wide range of specific compressive and tensile stresses are also possible. Compressive stresses from zero to 9000 psi and tensile stresses from zero to 18,000 psi may be had by varying current density, temperature and concentration of the bath's addition agent. Hanson-Van Winkle-Munning Co.

Circle 76 on page 89 for more data

Vertical Grinder

A 42-in. vertical universal grinder, with a normal maximum swing of 52 in., is designed for precision grinding large parts. The Model 3-TR, completely hydraulic in operation, does cylindrical grinding of all types—OD, ID, and angle—and also surface grinding. It provides capacity for multiple operation on one chucking.

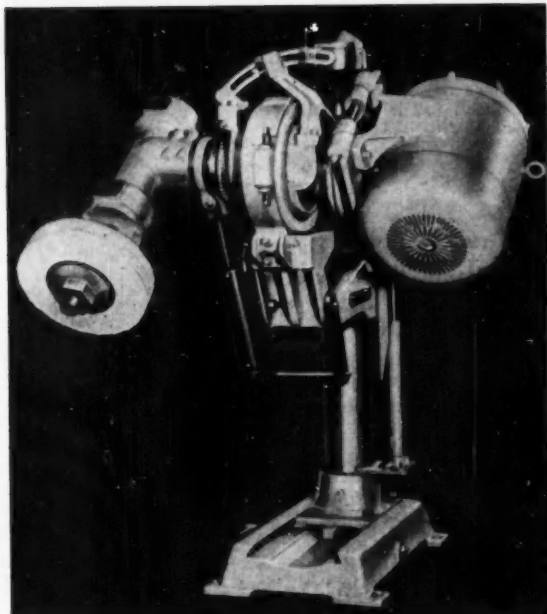
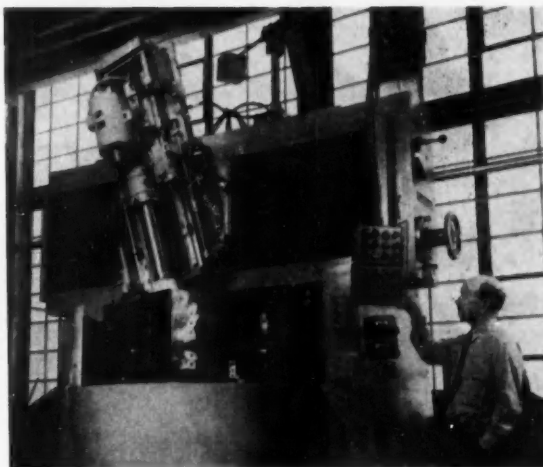
The tool can grind holes, tapered or straight, as deep as two ft. With the same setting of the head it grinds matching male parts. The head can be set at any angle up to 45 deg. The machine can also be furnished with a cross rail, that can be adjusted from 12 in. to 48 in. above the face plate. While one head is standard, the company will provide a number of heads and side-heads, according to the user's needs. It has work spindle speed ranges of up to either 88 or 176 rpm in either direction. The grinding head has a stroke

The Springfield 3-TR finished male and female mold parts with one setting in 4½ hr. vs. one week by hand lapping. Female square block was rough-bored on vertical turret lathe, and the 20 by 20-in., 15-deg taper hole and cone were finished automatically.

of 27½ in., with speeds of up to 185 ipm. Maximum clearance over the face plate is 25 in., and over the work spindle 30¾ in. Rapid traverse is

provided. The 10-hp wheel spindle motor speed is 3600 rpm. *The Springfield Machine Tool Co.*

Circle 77 on page 89 for more data



Murray-Way No. 55 buffing head.

Versatile Polishing Head

A heavy-duty multi-positioning buffing head known as the No. 55 can be positioned for any job by means of an adjustment on the front. With the fulcrum it can be rotated in a full 360-deg swing on both axes simultaneously. Fine centering of the wheel over work is accomplished by means of additional positioning ways on the head mounting bracket. *Murray-Way Corp.*

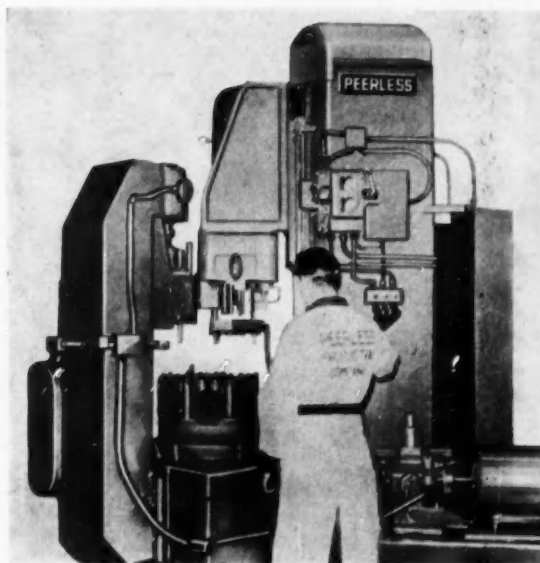
Circle 78 on page 89 for more data

Peerless vertical two-way drilling machine.

Special Two-Way Machine

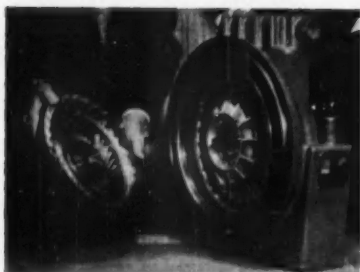
A vertical two-way machine performs drilling, chamfering and tapping operations on 160 automatic transmission transfer plates per hour at 100 per cent efficiency. It has a 14-in.-way hydraulic-feed unit and welded-steel tapping column, and a 24-in., four-station automatic power index. Tooling is comprised of a four-station fixture, 13-spindle drilling-and-chamfering head, and an individual single-spindle No. 19 lead-screw tapping head. *Peerless Production Co.*

Circle 79 on page 89 for more data



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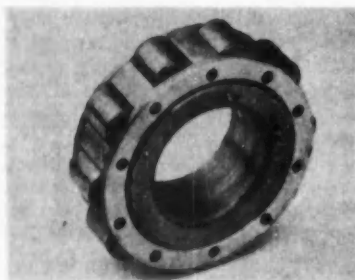


Torque Converters for Mobile or Fixed Service

The TC-200, -300 series of Torq-matic drives is designed for gasoline or Diesel engines of 40 to 150 hp. Three sizes, one with 3-element and two with 4-element converters, each have integral oil system, charging pump, oil cooler, sump and gear drive. Options include rear clutch adapter, automotive flange or industrial shaft,

and front clutch adapter. Height of basic converter is 21 in., diameter is 17 in., and weight is about 200 lb. Input torque ratings are 200, 320, and 370 ft.-lb. Maximum torque ratios are 2.0 and 2.5. *Allison Div., General Motors Corp.*

Circle 36 on page 89 for more data

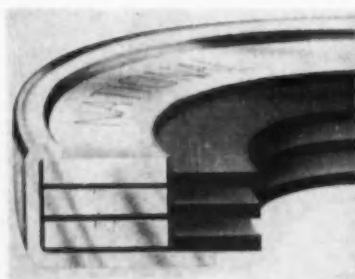


Bearing Runs in Stem Gear Bore

An MS type cylindrical roller bearing supports one end of a truck transmission main shaft. To replace the bearing's outer race, the stem gear is hardened and ground to the same hardness and finish as a normal bearing outer race. The space saving resulting from the removal of the outer race allows the use of a larger roller assembly.

Designed to support pure radial loads, the MS roller bearing has a channel type inner race of high chrome steel and a set of crowned rollers, separated and guided by means of a bronze retainer having accurately drilled and reamed roller pockets. *Rollway Bearing Co.*

Circle 37 on page 89 for more data

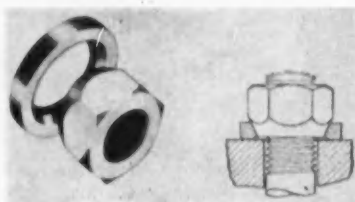


Oil Seal for Extreme Dust and Dirt

A different type of shaft seal for protecting bearings of agricultural and other heavy duty equipment is extremely simple in design and easy to install. The Triple-Lip Syntech seal employs three identical sealing lips of synthetic rubber, bonded to steel washers and enclosed in a rigid steel outer case. Use of these thin synthetic rubber sealing lips keeps

seal torque low, simplifies flush lubrication, and enables the seal to handle large amounts of shaft runout and misalignment. In tests, the seals have run repeatedly more than 4000 hr—equivalent to 13 years in agricultural equipment—under a heavy head of sand and dirt without adding lubricant. *National Motor Bearing Co.*

Circle 38 on page 89 for more data



Sets Load Without Torque Wrench

The Hi-Load spring locknut consists of a nut with a conical lower end that mates with a hardened steel washer to form a single assembly handled as one part. Hoop expansion of the washer results in a high spring load

with relatively small deflection. The spring load is equivalent to the safe load of the bolt. Nut is tightened until it bottoms. *Morse Products Development Co.*

Circle 39 on page 89 for more data

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FREE LITERATURE

Soluble Oils

1

A comprehensive but non-technical discussion of the types, uses, and handling of soluble oils for machinery operations, in eight pages, is this month's feature of *Lubrication* magazine. *The Texas Co.*

Keys, Pins

2

Production assembling with keys and pins is discussed briefly in a four-page bulletin of the *John Gillen Co.*

Welds Sans Heat

3

Welding aluminum by pressure, without heat, is one feature in the four-page issue No. 25 of *Technical Advisor*. *Reynolds Metals Co.*

Better Form Grinding

4

Details and application of the B-1 dresser for concave or convex formed wheels are given in an eight-page bulletin just issued. *Vinco Corp.*

Straddle Carriers

5

Uses in metalworking and other industries for Ross carriers are included in catalog C-1. *Industrial Truck Div., Clark Equipment Co.*

Cool Converters

6

Torque converter coolers, oil to air or water, for mobile and stationary applications are cataloged in bulletin No. 1054. *Young Radiator Co.*

Wheel Truer

7

A medium size Diaform wheel forming attachment for irregular shapes up to two in. wide and one in. deep, up to 14 in. diam. is described in circular No. 572. *Pratt & Whitney Div., Niles-Bement-Pond Co.*

H-P Bottles

8

Spherical fiber glass bottles for 3000 psi gas or liquid storage are now available to customer specifications. Four-page bulletin. *Eclipse-Pioneer Div., Bendix Aviation Corp.*

Centrifugal Casting

9

Details and applications of the Centri-Die process of centrifugal die casting alloy steels are available in a 12-page booklet. *Lebanon Steel Foundry.*

Hydraulic Oils

10

Selection of hydraulic oil is discussed in a 16-page treatise and catalog. *Denison Engineering Co.*

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7/1/54

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Machine by Tape

11

A system of recording motion on magnetic tape and playing it back for automatic programming of production machines and processes is described in bulletin GEA-6092 announced as available from the *General Electric Co.*

Machinability

12

Machinability data of current origin on the full range of commercial carbon and alloy steels as well as stainless steels is available in the *Steel Handbook* issued by the *Union Drawn Steel Div., Republic Steel Corp.*

Shell Molding Release

13

Two silicone release agents, for shell molders using deep draw, narrow draft patterns who wish to use solvent-type agents rather than water emulsions, F-496 and F-452, contain five per cent and 50 per cent solids, respectively, of high viscosity silicone fluids in mineral spirits. Data sheet 5-106. *Dow Corning Corp.*

Fork Trucks

14

Three models of the *Dynamotive* gas fork lift truck with electric transmission, are described in a new brochure by the *Automatic Transportation Co.*

O-Rings

15

A 12-page brochure on O-rings, giving detailed information on compounds, groove dimensions and sizes, contains diagrams of typical applications. *Goshen Rubber Co.*

Modernizing Presses

16

Modernization of stamping presses through rebuilding is outlined in 12-page bulletin No. R-49 reissued by *Verson Allsteel Presa Co.*

Ni-Cr Steels

17

Bulletins NS-5—eight pages—gives 28 charts which present a digest of information on the composition, heat treatment, transformation characteristics and mechanical properties of the standard AISI and SAE nickel-chromium steels, 3200, 3300, 3400, and Krupp. *International Nickel Co.*

Giant Bolts

18

A four-page illustrated folder giving prices on a new line of giant Unbrako cap screws, 1½ to 1½-in. diam., of heat-treated alloy steel has been prepared by *Standard Pressed Steel Co.*

Power Transmission

19

Data on variable-speed pulleys, wide V-belts, Select-O-Speed transmissions and other items are included in a 24-page catalog on power transmission equipment. *Lovejoy Flexible Coupling Co.*

Broaching

20

Special surface-broaching installations of the Ram-Press broaching machine line are featured in four-page bulletin RP-54. Automatic and semi-automatic fixtures, hydraulic clamping and multiple broach setups are illustrated in working sequences to show load and unload positions. *Colonial Broach Co.*

Punched Plates

21

Perforated patterns available for shipment from stock, and other patterns supplied perforated to order from carbon and stainless steel sheets and plates, for safety, ornamental and screening purposes, are shown in a four-page bulletin. *Joseph T. Ryerson & Son, Inc.*

Flex-Shaft Accessories

22

Aircraft accessories for use with flexible shafts, including engineering drawings, dimensions and operating characteristics of mechanical screw jacks, pressure bulkhead fittings and flexible adapters, are described in bulletin 5403. *S. S. White Industrial Div.*

Cam Clutches

23

Series 200 cam clutches, 10 to 500 ft-lb, for indexing, overrunning and backstop machine drive applications are covered in catalog C12-54. *Morse Chain Co.*

Testing

24

Two low-cost Baldwin-Tate-Emery universal testing machines of 20,000 and 60,000-lb capacity are described in four-page bulletin 4213. Principles of their hydraulic straining system and the Tate-Emery null method load indicator are given along with descriptions of accessories and specifications. *Baldwin-Lima-Hamilton Corp.*

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Observations

By Joseph Geschelin

Going Great

One of the real success stories in the machine tool field is found in the mounting installations of Buhr equipment around automotive circles. One of the most massive installations is found at the Saginaw Steering Gear Div., where a variety of these automatic drilling machines have been distributed among the three main plants operated by the division.

Cutting Ratios

Machinability ratings are among the most valuable bits of information required by factory management. In fact, we have been asked about the availability of current data on several occasions in recent months. We are glad to advise that the latest information on the machinability ratings of carbon steels, alloy steels, and stainless grades appears in a handbook issued earlier this year by the Union Drawn Steel Div., Republic Steel Corp. Besides machinability ratings, it also gives recommended speeds and feeds for typical machining problems.

Cold Clean

A recent issue of *The Houghton Line* reports continuing success in automotive plants in the adoption of the Houghton-Clean cold cleaning technique. It was a distinct surprise originally to find that metal parts could be cleaned effectively with solutions at room temperature, with only moderate temperatures in the case of particularly tough jobs. It is pointed out that the saving in heating costs alone is considerable. In some instances, reports show that better rust-proofing has resulted; and much lower tank maintenance costs are common.

Modern Trend

Recent issue of *Bliss'* magazine *Trends* points out an interesting trend toward packaged installations of machine tools. Some of the latest automotive presses are being delivered so

completely equipped that only electrical and air lines need be plugged in for the press to start its job. Too, more and more of the Bliss transfer presses are being ordered complete with the necessary tooling. Another example is that of welding presses with all wiring, piping, and controls

built in. Advantage of this trend is that equipment is more compact because all operating accessories are built into the machine before it leaves the Bliss plant; and what is even more important, the manufacturer assumes all responsibility for the installation.

Tubeless Tires as Regular Equipment

(Continued from page 56)

only—manufacturer to offer tubeless tires as optional equipment across the board. Packard has had signal success with this experiment.

It is also a matter of fact that tubeless tires can be mounted on the standard rims, thus making it feasible to offer them as optional equipment without affecting installation either on production lines or in the field. The only exception to this is in the case of wire wheels. Here there is the problem of making rims abso-

lutely leak-proof when they are manufactured.

This report is not intended to leave the impression that tubeless tires will be adopted by all makers; nor that those who do adopt them will offer them as standard equipment. Judging by the course of events, however, it is safe to say that tubeless tires have arrived and it may be only a question of a little time before they will have the status of standard equipment across the board.

BOOKS...

INDUSTRIAL PENSIONS, by Charles L. Dearing, published by the Brookings Institute, 722 Jackson Place, N.W., Washington 6, D. C. Price, \$3.75. Presented here is an original survey of this most recent development in the quest for economic security in old age. The book explores numerous aspects of these new pension arrangements; it examines the basic economic principles and facts which underlie industrial pensions; considers in detail the limitations of existing programs, and offers a new basis on which private and public policies can be formulated. The study defines the major factors since 1949 which have had a significant influence on industrial pension programs. The structure and operation of these programs are evaluated and some possible cures for the defects that have emerged are examined. The 1950 coverage and cost of private pension programs are projected for 1960. The long-range investment implications of the projected expansion of industrial pensions are then explored, with particular attention to the possible effects of pension financing on new capital formation and investment outlets.

ENGINEERING ANALYSIS, by D. W. Ver Planck and B. R. Teare, published by John Wiley & Sons, Inc., 450 Fourth Ave., New York 16, N. Y. Price, \$6.00. This book develops the subject by example with

special stress on the whole thinking process. The authors show what must be done to translate engineering situations into mathematical language, and what is necessary after a mathematical result has been obtained. More specifically, the book deals with such matters as: defining the problem to be solved; deciding what principle to apply; choosing coordinate systems; checking thoroughly; choosing dimensionless variables; and the sketching of curves. Topics include material from dynamics of translation and rotation, electric circuits, heat transfer, solution of linear differential equations with constant coefficients, uses of power series, integration by graphical and numerical methods, hyperbolic functions, and the evaluation of indeterminate forms.

THE GRAND PRIX CAR, VOL. 1, by Laurence Pomeroy, published by Motor Racing Publications, Ltd., copies available from British Book Center, 122 E. 53th St., New York 22, N. Y. Price, \$12.50. When the *Grand Prix Car 1906-39* was issued in 1949, it was said to be the first book to combine a history of motor racing with a scientific survey, based on an analysis of 17 examples, of the engineering ingredients which go to make up the racing car. In order to keep the story up to date, it has now been decided to produce a second edition in two volumes. The first of these provides basic information upon which knowledge of the modern racing car is founded. The whole of motor racing from 1894 to 1939 is surveyed in 14 chapters which describe and give the results of 235 events. There then follow detailed descriptions and drawings of 17 Grand Prix cars.

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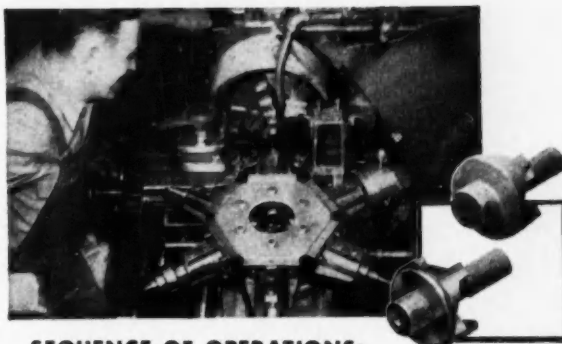
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It's all so much simpler with the Speed Selector. There's no need for time-wasting computations, no mental effort, no physical effort. With simple controls, either direct or prearranged, the operator gets the ideal f.p.m. cutting speed for each cut. And it's *much faster*, of course!

The Speed Selector is standard on Gisholt Nos. 4 and 5 Ram Type Turret Lathes and on all Gisholt Saddle Type Lathes.

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SEQUENCE OF OPERATIONS:

Note the star which indicates each time the Speed Selector is used.

- ★ 1. Hexagon turret—Center drill at 297 r.p.m. hand feed
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- ★ 4. Square turret—Finish turn, face and chamfer at 126 r.p.m. .002 feed
- ★ 5. Hexagon turret—Start and drill through at 226 r.p.m., .003 feed. Trip the Hi-Lo lever, eliminating even the need for turning the hand wheel
- ★ 6. Hexagon turret—Thread with tap at 39 r.p.m., leaders and followers

—and you're ready for a new workpiece

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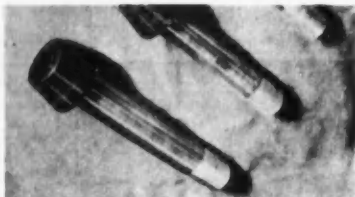
AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

'Strongest Bolt'

Precision bolts with a rated tensile strength of 200,000-225,000 psi are said to be the strongest steel fasteners of their kind ever to be made on a production basis.

Key to the production of this bolt is the ability to cold roll finished threads into 43-47 Rc steel. They come in 12 sizes ranging from 1/4-in.



to 1 1/2-in. diam, forged from 8740, 4340 and 4140 steels. Bolts up to 3/4 in. are cold forged; larger sizes are hot upset forged. The finished bolt is produced free of decarburization and is cadmium-plated with subsequent hydrogen embrittlement relief. In material and test performance, they conform to NAS and MS military specifications. *Standard Pressed Steel Co.*

Circle 46 on page 89 for more data

Accelerometers

A highly compact self-generating accelerometer, especially designed to determine frequency and amplitude at high voltages, provides power out-



put as high as two volts without external excitation. The self-generating accelerometer's sensitivity is as low

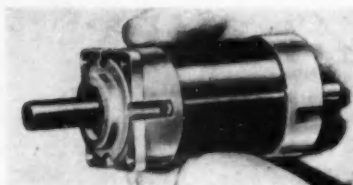
as plus or minus 0.003g, and frequency response is from two to 350 cps. The unit is said to operate with extreme accuracy at temperatures up to 550 F.

It is produced in a wide range of ratings, to be used for many types of impact acceleration studies, vibration analysis, and a wide range of other applications for aircraft, guided missiles and general industry. *General Scientific Corp.*

Circle 47 on page 89 for more data

Speed to Torque

A line of miniature precision integral planetary gear reducers convert high speed into high torque. These miniature packages are rugged, compact, precision gear trains designed as an integral package. Con-



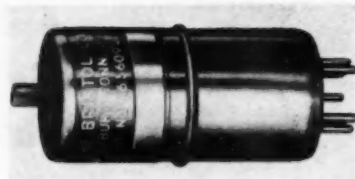
tinuous long term output torque ranges up to 1000 in.-oz and for short periods of time this may be greatly exceeded.

The basic unit diameter is 1 1/4 in. Length depends on any of the standard speed reduction ratios from 18.78 to 1, to 21,808 to 1. *Globe Industries, Inc.*

Circle 48 on page 89 for more data

Small Inverter

The development of a small non-resonant reed-type inverter capable of operation over wide frequency and ambient temperature ranges has been announced. The miniature Syn-croverter switch is capable of converting low-power d-c signals to alternating voltages.

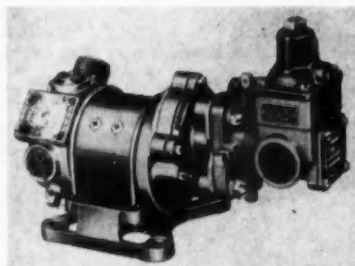


Shown actual size, it is designed for precision requirements on aircraft and missile applications and for gun directors, electronic computers, null detectors, and many other devices. Hermetically sealed, it is shock and vibration resistant and will fit into a seven-pin miniature tube socket and shield. *Bristol Co.*

Circle 49 on page 89 for more data

Jet Prestart Pump

The Model RG-9790 motor-pump unit is used as a prestart lubricating pump on gas turbine engines to provide lubrication prior to the engine coming up to speed. The pump is non-pulsating, positive displacement, rotary vane type. A balanced relief

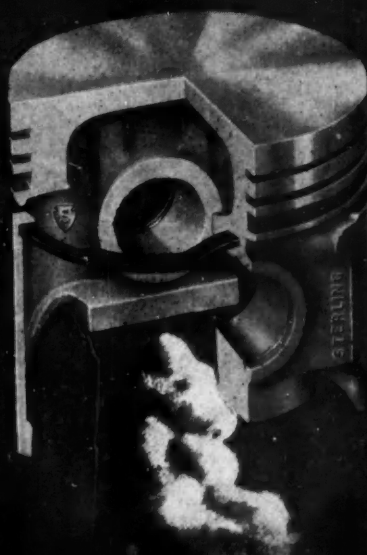


valve maintains closely regulated pressure under variable operating conditions, adjustable for three to 20 psi. The by-pass valve of the pump permits oil to flow through after the prestart pump has stopped. Operating speed is 2000 rpm and the capacity is 2 1/2 gpm at 20 psi. *Lear, Inc.*

Circle 50 on page 89 for more data

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CONSTANT CLEARANCE over the entire tem-
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STERLING CONFORMATIC PISTONS ARE AVAILABLE IN ALL SIZES AND QUANTITIES

METALS

Higher Lead-Zinc Import Duties Advocated as Smelter Shipments of Zinc Decline. Copper Probably Will Continue in Short Supply.

By William F. Boericke

Steel Operating Rate Up

By the middle of June the steel operating rate had risen to 73 per cent of capacity, the first time since February it had been scheduled that high. A variety of reasons are cited for the better business. Some hedge buying is evident against a possible strike, some against a price rise for steel products to compensate for a wage increase. Some buyers are worried about the strained international situation and want to increase inventories. Some have received increased defense orders, and are expecting more.

May production was 7.4 million tons, largest since January, but off about 2.6 million tons compared with May, 1953. The industry has operated at 70.7 per cent capacity since the first of the year. Most steel executives appear reconciled to an average operating rate of 72-75 per cent for the second half of 1954. If the industry gets by without a strike, as seems probable, there will probably be some softening in demand during the summer. Hot weather, summer vacations, and a tapering off of demand from Detroit as they change over models are given as reasons. Of course, all this could change if the international picture worsens.

Firm Prices for Steel

The price structure of the industry has remained amazingly firm in spite of severe competition in many lines, with freight absorption and elimination of extra charges. There have been a few exceptions. Early in June one of the smaller Eastern producers cut structurals and plates \$7 per ton below the regular market. The reduction was not followed by the larger plants. The odd thing is that structurals heretofore have been one of the best selling products of the industry because of heavy demand from construction. A pickup has been witnessed in wire, pipe, sheets, and tin plate. Oil country goods are wanted as usual. Galvanized products have benefited from the usual seasonal farm demand.

Uptrend Halted in Scrap Prices

After advancing for 11 consecutive weeks, the price of steel scrap fell off 33 cents per ton by mid-June to \$28.25. The price of iron ore is soft, although there has been no cutting. But demand is definitely off for ore. Two small eastern iron ore mines suspended oper-

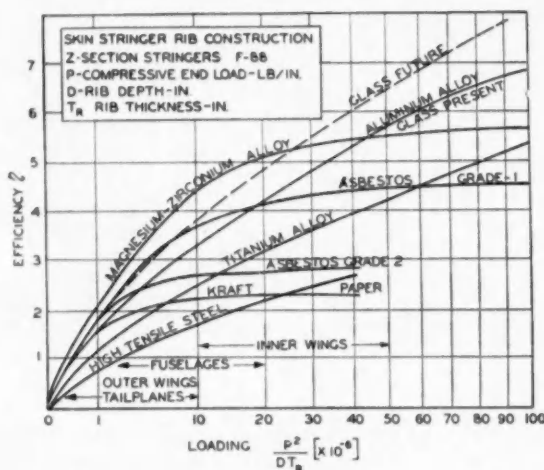
ations in April because of lack of orders. Shipments of ore on the Lakes is off substantially from last year, and totaled only 13.5 million tons for the first five months of 1954 against 25.2 million tons in the same period of 1953.

Zinc and Lead Prices Strengthen

Higher prices for zinc and lead announced last month were caused by better consumer interest, indicated Government buying for the stockpile, and belief that higher tariffs would be permitted by Washington following recommendations by the Tariff Commission. Zinc advanced 1¼ cents per lb from its low last February, and lead was firm at 14¼ cents. Buyers were

(Turn to page 120, please)

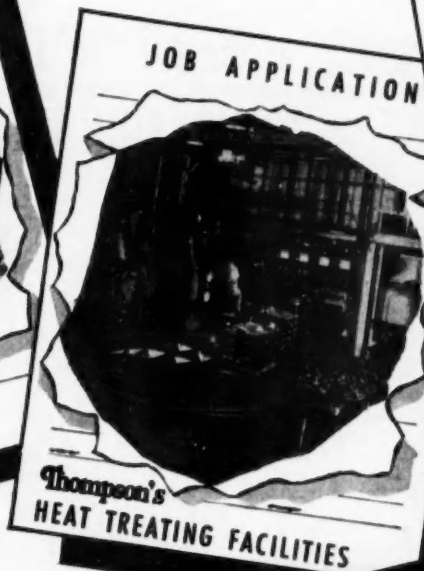
MATERIALS EFFICIENCIES IN AIRCRAFT COMPRESSION STRUCTURES



MATERIAL	E lb/in ²	fp lb/in ²	C lb/in ³
Asbestos } Grade 1	2.8x10 ⁶	18,000	0.0577
Phenolic } Grade 2	2.4x10 ⁶	11,000	0.0577
Plastic			
Glass } Present	2.2x10 ⁶	34,000	0.0613
Polyester } Future	6.0x10 ⁶	150,000	0.0758
Aluminum Alloy	10.5x10 ⁶	59,200	0.1035
Magnesium Zirconium	6.3x10 ⁶	25,400	0.0648
Titanium Alloy	15.5x10 ⁶	170,000	0.1585
High Tensile Steel	28.0x10 ⁶	90,000	0.283
Kraft Paper	0.8x10 ⁶	7,000	0.0451
Polyester Plastic			

Source: The Bristol Aeroplane Co., Ltd., England

AUTOMOTIVE INDUSTRIES, July 1, 1954



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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Dual Exhaust System Offered by Mercury

An additional exhaust system which can be installed on the left side of the car is being offered for the 1954 Mercury. The second exhaust unit connects to the rear end of a new manifold, which replaces the current one and eliminates the crossover pipe. It consists of a straight-through muffler, new inlet pipe and tail pipe. The new exhaust will cost about \$50, which does not include installation.

GE Reveals Building Of High-Thrust Jet

General Electric Co. has been permitted by the Air Force to make a guarded statement to the effect that it has developed a jet engine with over 15,000 lb of thrust. It was pointed out that the engine is not scheduled for production at the moment, as it was built primarily at the request of the Air Force to study the complex problems associated with the design and production of high-thrust engines.

There have been reports from time to time that GE had developed such a high-thrust engine called the J53, but no official name for this new power

AMPHIBIAN

Designated as the LVTP-5, this new armored, 85,000-lb personnel and cargo carrier was developed by Ingersoll Products Div. of Borg-Warner Corp. Now in production for the Marine Corps, it is a modern version of a similar vehicle used in World War II.



plant was disclosed. The company is currently producing the J47 and J73 jet engines for the Air Force and Navy.

L-M Factory Delivery Plan Breaks Record During May

A monthly record of more than 500 Lincoln and Mercury buyers picked up their new cars directly at the assembly plant during May under the division's factory retail delivery program. Of the total, more than 300 were from California alone. So far this year, 1728 cars have been delivered to buyers under the division's program started early in 1953.

Motor Products To Close Marion Plant by November

Motor Products Corp. is closing its Marion, O., plant over a four-month period. The plant, one of the largest in that area, has been producing ventilators, stampings, grilles and body trim for automobiles. A lack of orders from car firms was cited by the company for the shutdown.

Ford Turns Out Its Millionth '54 Vehicle

The one millionth 1954 vehicle produced by Ford Motor Co. came off the assembly line June 15. The car was a Mercury convertible.

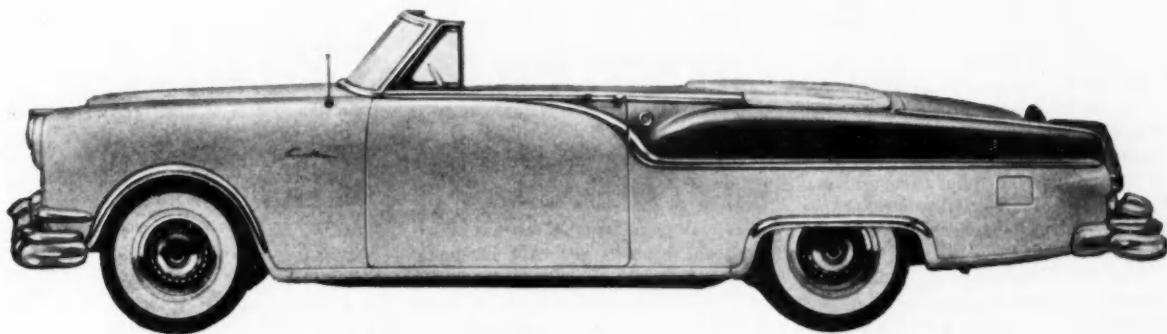
MIDDLE ATLANTIC STATES SHOW GAIN IN FOUR MONTHS OVER 1953 PERIOD

Regional Sales of New Passenger Cars

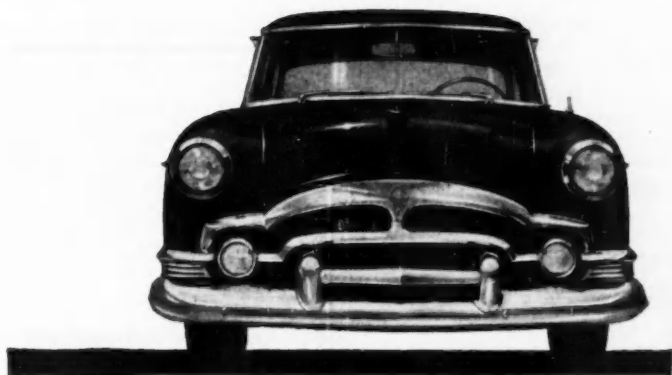
Zone	Region	April 1954	March 1954	April 1953	Four Months		Per Cent Change		
					1954	1953	April over March	April over April 1953	Four Months 1954 over 1953
1	New England	32,567	29,138	33,332	99,804	102,747	+11.77	- 2.30	- 3.08
2	Middle Atlantic	106,533	93,935	97,101	334,255	332,025	+13.41	+ 9.71	+ .67
3	South Atlantic	55,668	51,535	54,817	197,114	204,889	+ 8.02	+ 1.37	- 3.79
4	East North Central	132,626	133,278	135,973	466,890	468,986	- .49	- 2.46	- 4.53
5	East South Central	23,706	24,369	25,224	84,359	87,677	- 2.72	- 9.02	- 3.78
6	West North Central	56,810	47,960	64,115	186,635	179,654	+18.64	-12.95	- 5.67
7	West South Central	40,729	45,300	40,429	158,673	164,990	-10.09	+ .74	- 3.71
8	Mountain	15,322	13,262	19,235	49,926	61,130	+16.36	-20.34	-18.33
9	Pacific	44,996	42,614	57,932	160,763	190,247	+ 5.10	-22.36	-19.30
	Location Not Determinable	145			744				
Total—United States		590,102	480,731	526,278	1,699,123	1,787,425	+ 8.69	- 3.82	- 5.47

States comprising the various regions are:—Zone 1: Conn., Me., Mass., N. H., R. I., Vt.—Zone 2: N. J., N. Y., Pa.—Zone 3: Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4: Ill., Ind., Mich., Ohio, Wis.—Zone 5: Ala., Ky., Miss., Tenn.

—Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7: Ark., La., Okla., Tex.—Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9: Cal., Ore., Wash.



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selects and distributes **PERFECT CIRCLE**

2 in 1 chrome piston ring sets for authorized replacement service

Perfect Circle piston rings
THE STANDARD OF COMPARISON

Studebaker and Packard Amalgamation

(Continued from page 33)

Packard proposes to reclassify its stock so that each now outstanding five Packard shares will become one share common stock of the par value of \$10 per share. Upon the purchase by Packard of Studebaker assets, the name will be changed to Studebaker-Packard.

Each Studebaker stockholder will receive 1½ shares of the new Studebaker-Packard stock for each one Studebaker share presently held. The net result of the transaction will be that Studebaker-Packard will own both businesses and will have outstanding 6,440,455 shares, of which 3,542,187 will be held by Studebaker stockholders and 2,898,268 shares by Packard stockholders.

Organizational Setup

Basic structure of Studebaker-Packard Corp. will be a central parent organization, with the Studebaker and Packard divisions operating as autonomous organizations in much the same manner as General Motors and its divisions. President and chief executive officer will be James J. Nance, who took over the presidency of Packard two years ago.

Paul Hoffman, Studebaker board chairman, will hold that same position in the new corporation. H. S. Vance, president of Studebaker, will be chairman of the Executive Committee. Hugh J. Perry will retire as Packard chairman but will remain on the board of directors.

Forecast of the Future

Executive offices of the new company will be maintained in Detroit and South Bend, Ind. Long-range plans reportedly call for some type of eventual consolidation with American Motors and possibly one or more supplier companies.

Whether or not Willys, or perhaps the Jeep portion of its business, may be invited into the combination is a matter of speculation. The current Willys debt structure is a discouraging factor in that regard, but a deal possibly might be worked out to split off the commercial vehicle business and merge it into the larger organization.

At any rate, it appears logical that the industry will wind up with a Big Four within the next couple of years. The days of the Big Three, plus a number of smaller independent companies, have gone forever.

Readjustment among the affected companies will be gradual and, in some cases, rather painful. However, the net result is likely to be a consolidated operation strong enough to carve out for itself an economically practical slice of the market. Also, it should result in operating economies that will permit the combine to market its products at a price to meet competition from the Big Three.

Benefits to Both Parties

Consolidation of Packard and Studebaker is a natural one, since it will provide a product line across the entire price range with very little conflict. Studebaker undoubtedly was attracted by the quality of Packard's management and its excellent manufacturing facilities, including the new Utica plant, which is being tooled with the most modern automatic machinery for production of engines, transmissions, and axles.

Packard also has acquired under lease from Chrysler, with option to buy, a large body assembly plant in Detroit. In addition, Packard is known to have a new V-8 engine and an improved automatic drive ready for 1955 models. It also is no secret in Detroit that Packard aspires to become a supplier of important components, such as engines and transmissions, to the rest of the automobile industry outside the Big Three.

For its part, Packard gains a sizeable and seasoned dealer body from Studebaker. Both car lines will be made available to both dealer groups. This does not necessarily mean that all dealers will handle complete lines of both cars, but some will handle a dual line.

At the present time, Packard has 1200 dealers and Studebaker about 2500. The total is expected to be increased to 4000. Studebaker trucks will be handled also by selected Packard dealers.

Another advantage accruing to Packard is the large new Studebaker assembly plant at New Brunswick, N. J., and two other assembly plants at Los Angeles and Hamilton, Ont.

So far as the benefits of integration on product lines are concerned, there will be none for 1955 models, but some are expected in 1956. More complete benefits are expected to show up in 1957 models.

This indicates that, at least for the time being, Studebaker will retain its

STATISTICAL SUMMARIES as of April 30, 1954 (Unaudited)

STUDEBAKER

Net Sales (Four Months).....	\$92,363,856
Unit Sales (Four Months).....	
(cars)	31,756
(trucks)	5,293
Current Assets	\$83,298,697
Current Liabilities	\$37,239,044
Working Capital	\$46,059,653
Property, Plant & Equipment	\$57,746,777
Total Net Worth.....	\$97,821,631
Floor Area of Plants (sq ft)	
South Bend, Ind.	7,905,674
Los Angeles, Calif.	368,464
New Brunswick, N. J.	420,670
Hamilton, Ont., Canada....	314,520
Mexico City, Mexico.....	150,000
No. of Employees.....	15,000
No. of Dealers in U. S.	2,500

PACKARD

Net Sales (Four Months).....	\$71,774,100
Unit Sales (Four Months) (cars)	16,900
Current Assets	\$70,119,549
Current Liabilities	\$29,153,203
Working Capital	\$40,966,346
Property, Plant & Equipment	\$38,617,580
Total Net Worth.....	\$81,889,331
Floor Area of Plants (sq ft)	
E. Grand Boulevard,	
Detroit	4,489,000
Utica, Michigan	1,134,000
Conner Avenue, Detroit....	760,000
Mt. Elliott Avenue, Detroit	303,000
Proving Grounds	41,000
No. of Employees.....	9,000
No. of Dealers in U. S.	1,200

own V-8 engine, plus the Borg-Warner automatic transmission. Ultimately, it is likely that Packard could supply both engines and transmissions as a unit, not only to Studebaker but also to American Motors, which is badly in need of a new engine line.

Ultrasonics and Automation Linked in Sperry Instrument

Shown to members of the press at a special preview late last month was a new ultrasonic instrument for inspecting automatically metal parts in engine manufacturing. Known as SIMAC, the precision instrument simultaneously applies ultrasonics and digital automation to parts inspection as production line procedure.

The instrument was developed by Sperry Products, Inc., at a cost of \$300,000 and derives its name from its function—sonic inspection measurement and control. It is being installed in the Quality Control Dept. of Alison Div., General Motors Corp., specifically for the inspection of jet engine rotor forgings and other unfinished parts.

The scanning device makes detection and identification of defects a cost-saving routine in quality control.

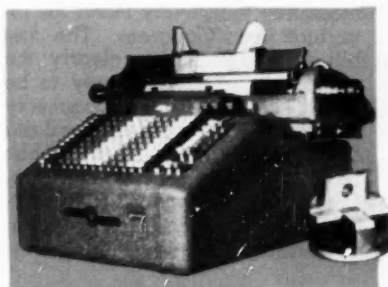
JUST A MATTER OF CONTROL

LORD ENGINEERING CONTROLS VIBRATION

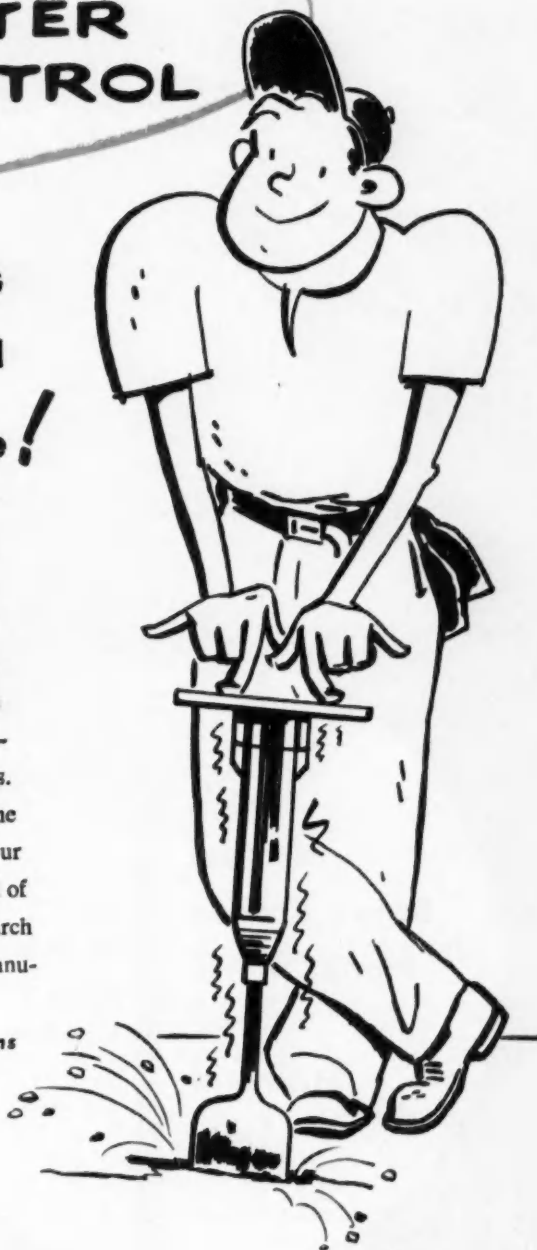
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The difference between a good product and a better one is often just A Matter Of Control—control of vibration and shock which may be damaging your product. Pioneers in solving vibration problems for many industries, Lord Manufacturing Company is well qualified to assure you of better performance from your products through the use of Lord Vibration Control Mountings and Bonded-Rubber Parts. Our Engineers will be pleased to help you in the analysis of the vibration which may damage your product and in the selection of the correct method of control. Lord Engineering means Materials Research—Engineering Research—Product Design—Manufacturing Know-How for your application.

*Over 27,000 designs and their variations
from which to choose.*



Here is one example of Lord Engineering on sensitive business machines. The Burroughs Sensimatic Accounting Machine is supported on LORD Mountings to reduce noise and cushion shock.

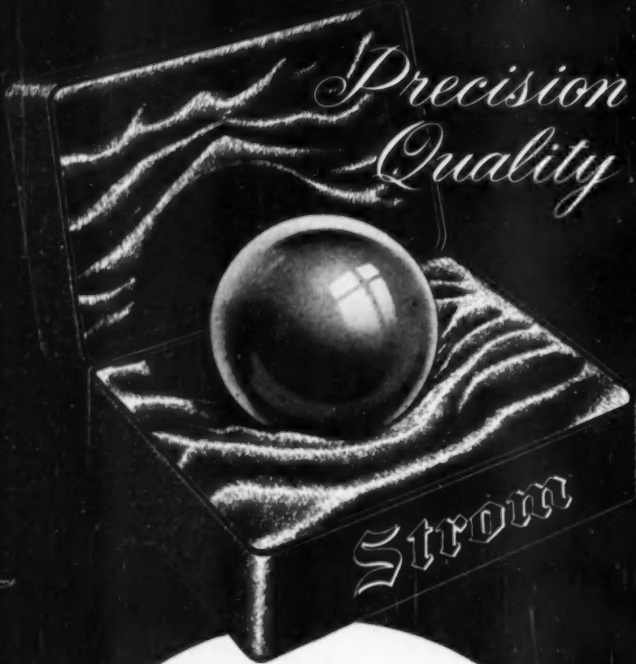


LOS ANGELES 28, CALIFORNIA 7046 Hollywood Blvd.	DALLAS, TEXAS 313 Fidelity Union Life Building	PHILADELPHIA 7, PENNSYLVANIA 725 Widener Building	DAYTON 2, OHIO 410 West First Street
DETROIT 2, MICHIGAN 311 Curtis Building	NEW YORK 16, NEW YORK 280 Madison Avenue	CHICAGO 17, ILLINOIS 520 N. Michigan Ave.	CLEVELAND 15, OHIO 811 Hanna Building

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**ON OUR
WASHINGTON WIRE**

Corporations and individuals alike will benefit from a pending Federal tax law change permitting an optional method of charging off depreciation costs of business equipment. It would provide a greater depreciation allowance in the early years following acquisition, but the allowance would be less in later years.

Negotiations to be completed before the end of December will determine new ownership of the 27 synthetic rubber facilities now owned by the Government. At the deadline date for submission of offers, 54 bids and 19 alternate proposals for purchase of these properties had been received.

Automotive equipment manufacturers may be interested in a new Army device to ease parking worries. A spring antenna hooks to the underside of either bumper, projecting eight in. forward or rearward. If the antenna is forced against any object, a switch mechanism turns on a dashboard light to warn the driver.

Highway programs in future years would be affected to a marked degree by two legislative measures tentatively listed for introduction in Congress. The first bill would pin down clearly the amount of research money to be made available to Commerce Dept. from the new Federal-aid authorization provided in Public Law 350. In a second measure, Congress will be asked to authorize money for the states to use in purchasing right-of-way property.

If all goes well, General Services Administration will present to Congress next year a proposed plan for improving control and management of the gigantic Government motor fleet.

- for engine capacities from 135 to 600 lbs.-ft. torque
- single or double plate
- plate sizes from 9 to 17 inches



LONG

...for heavy-duty clutch requirements



Insistence upon the finest quality has been an inflexible practice at the Long Manufacturing Division for over 50 years. Long quality is proven with the millions of Long Clutches being road tested every day on cars, trucks, buses and tractors.

LONG MANUFACTURING DIVISION • BORG-WARNER CORPORATION

Detroit 12, Michigan, and Windsor, Ontario

CLUTCHES • RADIATORS • TORQUE CONVERTERS • OIL COOLERS

Making and Painting Car Heaters

(Continued from page 63)

Finally, the inlet flange was spot welded to the assembly in eight places.

With the new equipment, manual riveting and welding have been eliminated. First, the two halves of the inlet ducts are assembled over a welding die. Safety buttons are actuated and the machine automatically spot welds the eight positions simultaneously. The table then returns and the ejector kicks the part out of the

die to be transferred to the conveyor, for delivery to the next station.

Blower housings are assembled over the die in a similar manner. The bracket is first loaded in the machine and held in position by a conventional quick clamp. The inlet flange is then loaded and secured by a second clamp equipped with a safety switch which prevents the welder from cycling until the clamp is in place.

As the machine is cycled, the top eight guns descend and series-weld a like number of spots on the inlet flange. Next, four side guns are actuated and direct-weld the mounting bracket to the housing.

The most important consideration, the reduction of overall costs, has been more than accomplished through reduced individual handlings. In addition, actual welding time has been greatly shortened.

Another recent installation in the plant is a new type Ransburg electrostatic paint spray system. The automobile heater components were formerly sprayed with equipment which necessitated considerable labor for housekeeping because of excessive overspray. In addition, overspray was partially picked up by a filter system which made it necessary to replace filters each night.

The paint sprayer now used is of the floor disk type. A pump unit supplies paint through a hose to the disk where rapid rotation feeds the paint at a uniform rate to its outer edge.

The equipment is flexible in operation. Almost any metal article and many non-metallic articles can be coated by this method. Only a relatively small air movement is required for removal of solvent vapor. Conventional type spray booths are not necessary since there is no appreciable amount of overspray paint to be exhausted.

The painting area is located adjacent to the route of an extensive overhead chain conveyor system which is used for inter-departmental transportation of the heater components. As the main carrier passes the painting department, operators remove parts from the conveyor hooks and place them on the secondary conveyor which feeds the spraying equipment. As the parts emerge, they are again returned to the main conveyor.

With previous paint spray equipment, the amount of paint used could not be correspondingly correlated to a low conveyor speed. Thus, it was necessary to run the secondary conveyor at twice the speed of the inter-departmental carrier and shut off painting 50 per cent of the time. As a result of spraying only half the time, excess parts had to be temporarily stored on the floor.

Under the present system, both conveyors are synchronized since spray output can now be regulated even at slow speeds. Not only is less paint used, but excess pieces need not be stocked awaiting space on the main conveyor.

Highest Precision

HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud has to be right—every feature is. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

Henry W. Brown
PRESIDENT



Parts Include
King Pins
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Countershafts
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Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
anything in the
line, of any analysis
steel, up to 4 1/4" diameter.

THE BROWN CORP.

213 BELLEVUE AVE.

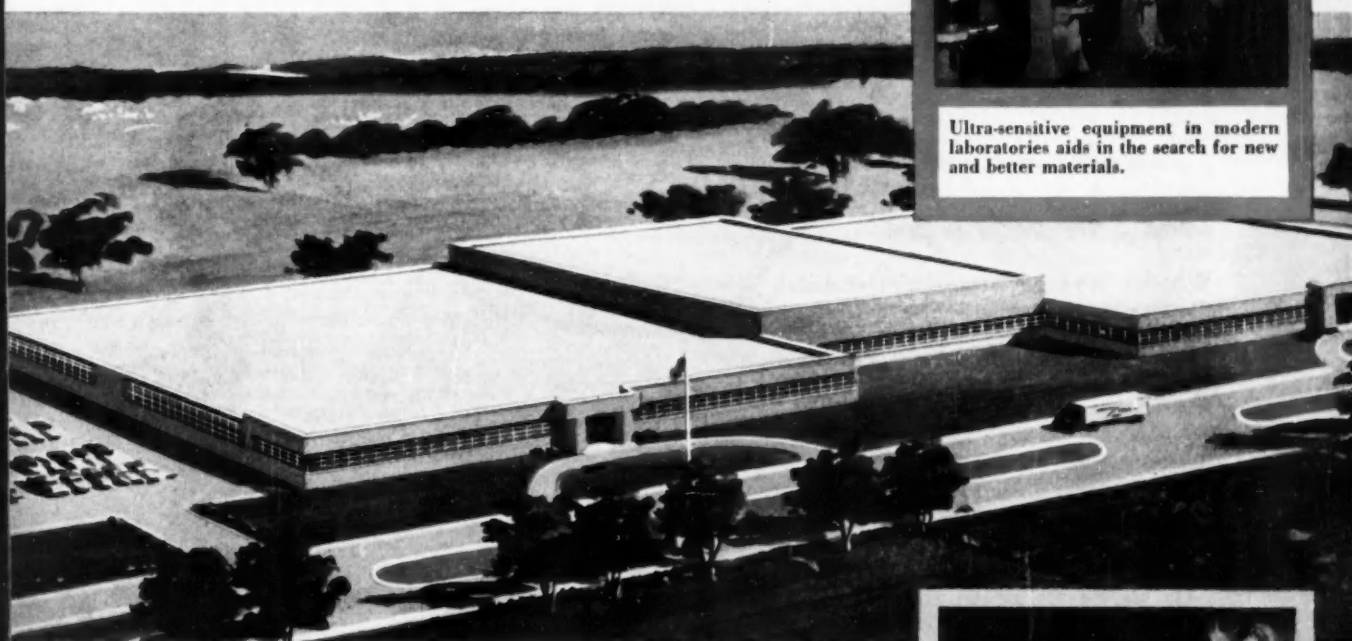
SYRACUSE, N. Y.

C. H. Elmer, 2407 Cleveland Rd., Cleveland • W. F. Spring, 4716 Bellvue Rd., Detroit • R. C. Sanderson, 1828 N. Clark St., Chicago • Harry J. Windmiller, 1354 Carlton, Fort Worth • John W. Miller & Co., 1449 N. Spring St., Los Angeles, Calif. • John B. Ford, 5611 S.E. Yamhill St., Portland, Ore.

FACTS ABOUT



CURRENT PROGRESS



Plant 3, Mineola, N. Y.

This, the newest of three plants engaged in powerplant development and production, symbolizes the *planned* growth of the Fairchild Engine Division... and the progressive spirit of an organization that has pioneered in its field for over a quarter of a century.

Within these modern, completely equipped plants — totaling almost one million square feet of floor space — a variety of special-purpose powerplants are being designed and produced for use on land, at sea and in the air. These include the J44 turbojet engine, developed by Fairchild for the Navy and now in volume production for each of our Armed Services, new-type propulsion systems for underwater ordnance, and auxiliary aircraft engines... all in addition to a greatly expanding component manufacturing program.

Today, to meet these increased responsibilities, the Fairchild Engine Division is growing bigger... to serve America better.



Manufacturing skills support producibility of Fairchild J44 turbojet engines for pilotless aircraft.



Ultra-sensitive equipment in modern laboratories aids in the search for new and better materials.



Advanced procedures maintain quality of J47 turbines, phase of large-scale component program.



AIRCRAFT DIVISION, Hagerstown, Maryland
AMERICAN HELICOPTER DIVISION, Manhattan Beach, Calif. • GUIDED MISSILES DIVISION, Wyandanch, N. Y.
SPEED CONTROL DIVISION, Wickliffe, Ohio • STRATOS DIVISION, Bay Shore, N. Y.

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for
the
right
tube
in

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Complete Range of
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Whether it's for a pressure, mechanical, sanitary or ornamental use — Standard offers you a convenient "one source" answer to your welded Stainless Steel Tubing need.

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Schedule 40



TYPES: 430, 302, 304, 309, 316, 321, 347; and others including low-carbon grades.

SHAPES:
Squares,
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and
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**PIPE
SIZES:**
1/8" to 4" IPS
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Send for Stainless Folder! Our engineers will gladly assist you in your selection of the tube best suited to your needs! Write today!

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- WELDED CARBON STEEL MECHANICAL TUBING
- BOILER AND HEAT EXCHANGER TUBING
- EXCLUSIVE "RIGIDIZED" PATTERNS



CALENDAR

OF COMING SHOWS AND MEETINGS

Western Plant Maintenance Show, Los Angeles, Calif. July 13-15

Truck-Trailer Manufacturers Association, summer meeting, Edgewater Beach Hotel, Chicago, Ill. July 22-23

SAE West Coast Meeting, Los Angeles, Calif. Aug. 16-18

Leipzig Trade Fair, Leipzig, Germany Sept. 5-15

National Fluid Power Association, fall meeting, Hotel Commodore, New York, N. Y. Sept. 7-9

Society of British Aircraft Constructors, exhibition and flying display, Farnborough, England Sept. 7-12

ASME Fall Meeting, Schroeder Hotel, Milwaukee, Wis. Sept. 8-10

SAE National Tractor Meeting, Hotel Schroeder, Milwaukee, Wis. Sept. 13-16

First International Instrument Congress and Exposition, Philadelphia, Pa. Sept. 13-24

Fourth European Machine Tool Exhibition, Milan, Italy Sept. 14-23

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. Sept. 15-17

Society for Experimental Stress Analysis, annual meeting and exhibition, Bellevue - Stratford Hotel, Philadelphia, Pa. Sept. 21-23

ASME Annual Engineering Conference, Statler Hotel, Los Angeles, Calif. Sept. 27-30

National Industrial Packaging and Materials Handling Exposition, Chicago, Ill. Sept. 28-30

Association of Iron and Steel Engineers, annual convention and exposition, Cleveland, O. Sept. 28-Oct. 1

SAE National Aeronautic Meeting, Statler Hotel, Los Angeles, Calif. Oct. 5-9

Paris Automobile Show, France, Oct. 7-17

National Conference on Industrial Hydraulics, Sheraton Hotel, Chicago, Ill. Oct. 14-15

SAE National Transportation Meeting, Sheraton-Plaza Hotel, Boston, Mass. Oct. 18-20

National Safety Congress and Exposition, Chicago, Ill. Oct. 18-22

International Motor Show, Earls Court, London, England Oct. 20-30

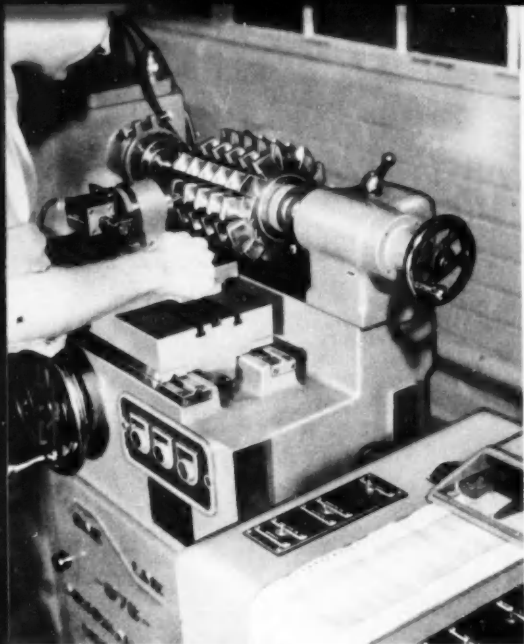
National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco, Calif. Oct. 25-27

SAE National Diesel Engine Meeting, Statler Hotel, Cleveland, Ohio Oct. 26-28

Twelfth Annual Diffraction Conference, Mellon Institute, Pittsburgh, Pa. Nov. 3-5

SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla. Nov. 4-5

Pan-American Road Race, Mexico Nov. 19-23



ACCURACY—Accuracy of the gear is directly related to the accuracy of the hob that generates the teeth of the gear. A Michigan Tool inspector is shown here checking and charting the accuracy of a large two-thread Michigan Process hob on the Michigan Sine-Line model 874 hob lead checker.



15 SHEAR-SPEEDS—Four of a battery of fifteen Michigan Shear-Speed gear shapers which cut a variety of slots or serrations on malleable planetary elements in a large automotive automatic transmission plant. All slots or serrations are cut simultaneously, in some cases two parts at a time, by the Shear-Speed gear shapers.

NEW 3-WAY GEAR SELECTOR automatically segregates 100% of gear production into undersize, oversize and OK gears as fast as they are cut or finished. Made in both gravity and conveyor types. May be attached to any gear cutting or gear finishing machine. Can be integrated with the machine cycle to automatically shut off the machine whenever a certain percentage of undersize or oversize gears are produced.

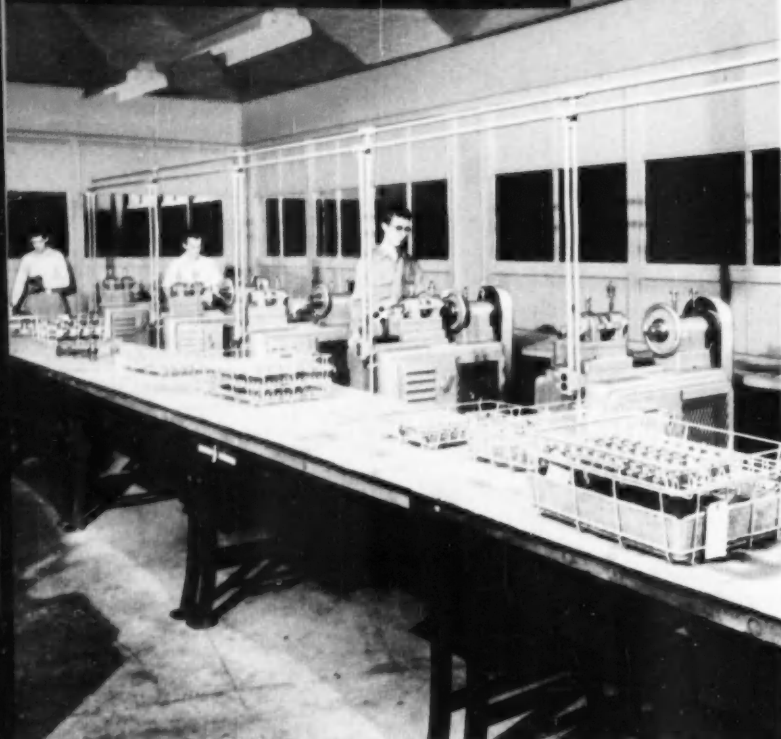


MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO. LTD.

Over

This Month's **GEAR PIX**



GEAR INSPECTION—One of the rows of Michigan model 1129 gear speeders used to inspect gears in a large automotive automatic transmission plant, prior to assembly. Gears are speeded in mesh under brake loads to check quietness and tooth contact.

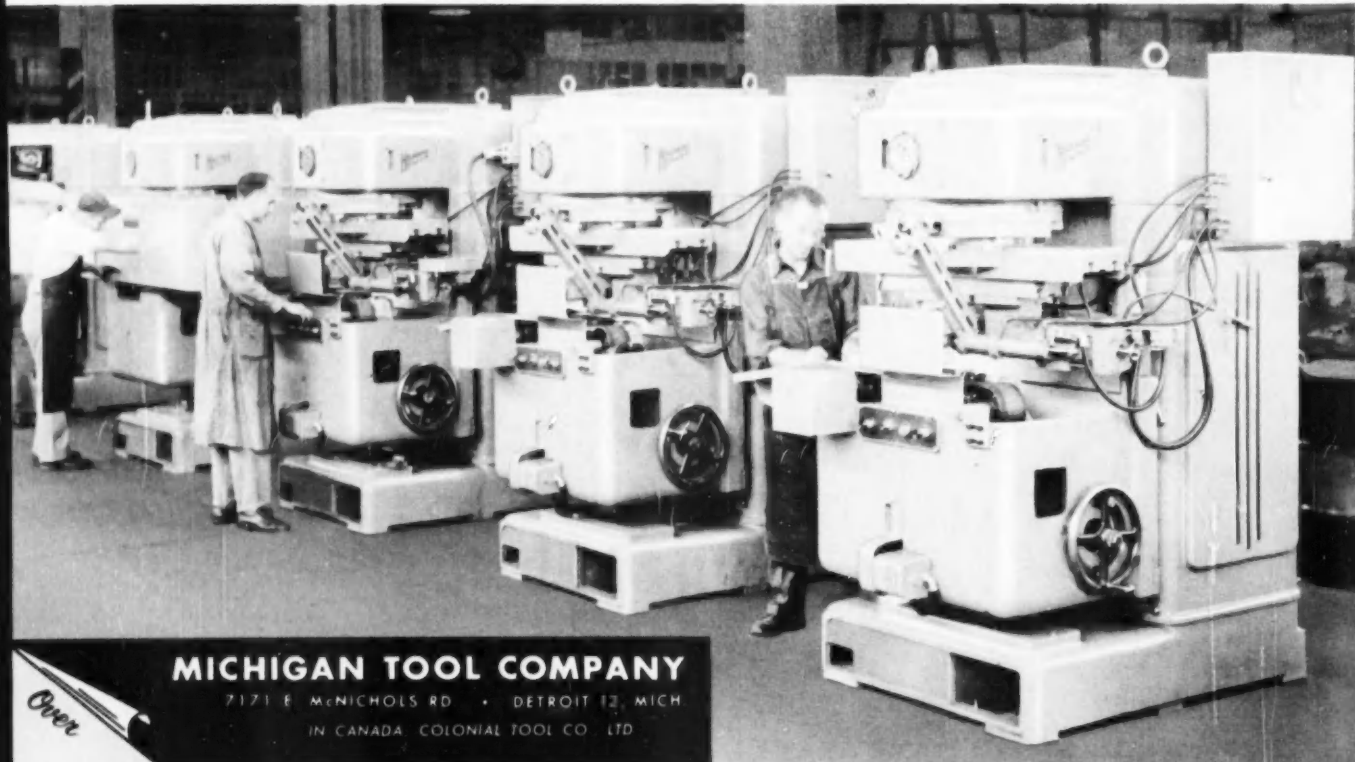


INVOLUTE AND TOOTH SPACING

—One of the leading lathe manufacturers uses this Michigan Sine-Line model 1124 involute and tooth spacing checker to inspect the involute contours and tooth spacing on the helical and spur gears that are used in their line of lathes.

AUTOMATIC LOADING & SIZING

More than four out of five of the standard Michigan 870 gear shavers now being built are equipped with automatic chute loading and automatic size checking. This speeds up the shaving cycle and permits one operator to handle up to three of these machines with ease.



MICHIGAN TOOL COMPANY

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Over

Major New Designs

(Continued from page 53)

operation of trucks is the fuel bill.

There are, however, some irritating shortcomings in the present transmissions that offer a chance for new designs to score valuable points. Due to the great number of gear steps required, it is a very difficult task to always keep the sliding gear system in its ideal drive ratio. Such operations require well experienced and conscientious drivers. Losses of performance and economy, while shifting gears in the present transmissions, are in proportion to the expertness of the driver whose task is not simple on long-haul commercial highways, where numerous grades and impeding traffic conditions are met. An automatic transmission guaranteeing the correct drive ratio under all conditions, which would operate equally well with all kinds of drivers and improve truck fleets' average performance, if not also the average efficiency, would find a ready market.

The pickup and delivery trucks operating in metropolitan areas present a less difficult problem in the commercial field. Their transmission problem is similar to the light weight city service bus problem. Long life with good reliability, automatic ratio changing providing acceleration to traffic speeds, and fairly high efficiency are prime requirements. Weight and size are important but the cost has to be kept down as this class of vehicle is generally low priced.

The military field presents problems and needful requirements entirely of its own. Mechanical reliability, performance, ease of operation, maneuverability, efficiency, minimum maintenance, compactness, minimum weight and cost are all universally admitted virtues in military transmissions. Where maximum gradeability would often be required unexpectedly, and maximum acceleration to top speed after a momentary slow down was of prime importance, the gear shift transmission proved unsatisfactory. The extreme demands of maximum tractive effort and, yet, high top speed, meant that a very high spread of transmission ratio easily available to the driver was necessary. These requirements apply somewhat to heavy-duty, off-the-road vehicles, as well as the Army's cross-country track laying and wheeled vehicles.

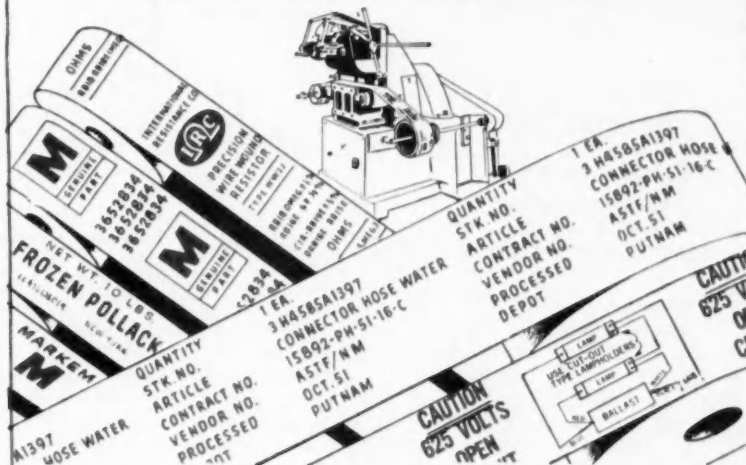
(Turn to page 110, please)

AUTOMOTIVE INDUSTRIES, July 1, 1954

MARKEM

SOLVED THIS MARKING PROBLEM

PRINTING LABELS ON PRESSURE SENSITIVE TAPE



The introduction of pressure sensitive tape for industrial uses offered many advantages if label data could be printed on the tape *in the plant itself when needed*. Markem developed methods that permit printing of stock number, part number, trade mark or other designation on this tape. Label inventory problems are thus eliminated. Manufacturers can now print the exact number of labels required . . . readily changing variable information or color of ink when desired. The Markem method used includes a Markem machine which makes up to 85 imprints per minute, rewinds the roll of tape automatically, and shuts itself off after a selected number of imprints. Thus Markem has provided industries of all types with a more modern, more attractive and less expensive means of labeling.

MARKEM

MARKS THEM ALL



CAN MARKEM HELP YOU?

Printing labels on pressure sensitive tape is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure continued satisfaction with Markem methods and equipment.

When you have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has already been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 8, N. H., U. S. A.

MARKEM

... TO MAKE YOUR MARK

(Continued from page 109)

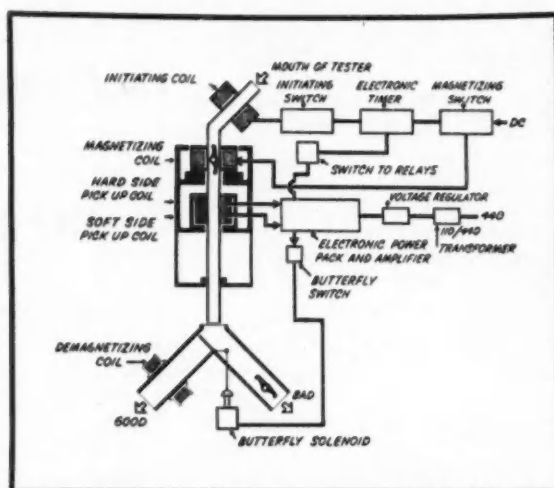
During the year of 1953, over 50 per cent of the passenger cars produced in America were equipped with automatic transmissions which used planetary gearing for automatic shifting, together with fluid drive of the fluid coupling or torque converter type. Data on these automatic transmissions are given in the accompanying table.

Electronic Hardness Tester

By M. J. Diamond
Research Engineer
Central Foundry Div.
GENERAL MOTORS CORP.

THE operation of a complete cycle for checking a rocker arm electronically is as follows: As the rocker arm is dropped into a tube (Fig. 1) it passes through a coil which initiates a circuit for applying 125 volts d-c to the magnetizing coil for a timed interval. This magnetizing coil has the force to pull the casting into its magnetic center for saturating while suspended there for approximately one-third of a second.

Fig. 1—Diagram of Central Foundry electronic hardness tester.



Thus, all rocker arms at the end of its magnetizing cycle would drop by "free fall," the same distance to a double wound pick-up coil pancake type. Each pick-up coil feeds its electrical impulse to its own amplifier, and each amplifier controls its own thyratron tube, one to pass or reject at the soft side of the range and the other to pass or reject at the hard side of the range.

The electronic hardness tester is

set up by the use of rocker arms previously selected for their hardness which was determined by brinelling. A complete set of test rocker arms consisted of a pair at the soft end of the range and a pair at the hard end of the range. One of each pair is 0.1 mm within the allowable range and the other is 0.1 mm out of the range. In setting the machine up the amplifier is adjusted until the two within the range are passed and the

Bendix Builds a Better cable clamp *the* AN3057B

Inexpensive • Efficient • Versatile

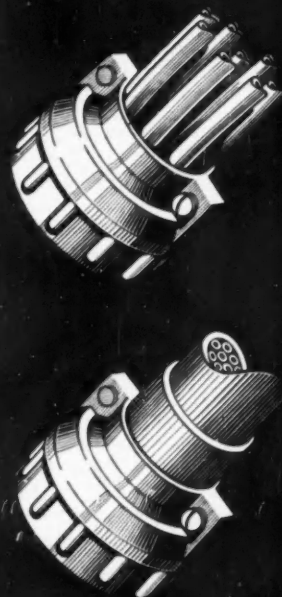
The new Bendix AN approved AN3057B cable clamp is now available. Engineered by Bendix to the highest quality standards, this cable clamp offers major design improvements. The clamping action is radial and completely eliminates wire strain and chafing by holding the wire bundle firmly in rubber. This clamp will accommodate a wide range of wire bundle sizes, but an even greater range can be handled through the use of the Bendix AN3420A accessory telescoping sleeve.

The new AN3057B cable clamp will also waterproof multi-conductor rubber covered cable on the rear of a connector, or where moisture-proof entrance through a bulkhead or into an equipment box is required.

This versatile clamp is a product of the Scintilla Magneto Division of Bendix Aviation Corporation and is a companion AN accessory to the world famous Bendix Scintilla line of electrical connectors. Write our Sales Department for details.

Outstanding Features

- Neoprene gland.
- Centered clamping action.
- Increased close down.
- Positive grounding feature.
- Cadmium plated die-cast aluminum nut.
- Shorter over-all length.
- Waterproofs multi-conductor cable.
- Immediate delivery.



Bendix

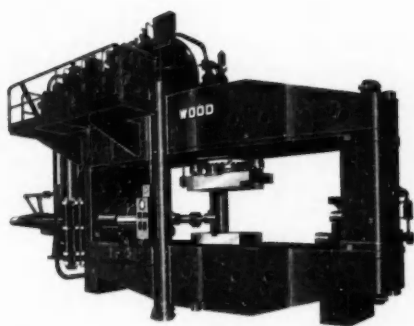
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*Would
you
trust
the
woolly
bear?*



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This 600/900-ton hydraulic press is designed for general upsetting work on steel tubes, bars, shafts, axles and the like. Presses of this type can be furnished in larger and smaller sizes for most upsetting operations. Write for our catalog and for engineering aid—both yours without obligation.

Some people say that he can foretell the weather. Some say he can't. All well and good where guessing the weather's concerned. But in a business way, you have to rely on more trustworthy yardsticks than woolly bears. There *can't* be a doubt when you're investing in capital equipment. A Wood hydraulic press, for example. So—if you're not yet using Wood machines, you ask someone who is. And you find that he's satisfied with his press and the profit it makes for him. If you already *are* a Wood customer, your problem is solved. You order another Wood press. Ask for descriptive catalog.



R. D. WOOD COMPANY

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Representatives in Principal Cities



MAKERS OF HYDRAULIC PRESSES AND VALVES



FIRE HYDRANTS



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GATE VALVES



GAS PRODUCERS



ACCUMULATORS



Are you getting 'VALUE RECEIVED' in Steel Castings?



Similar castings? Yes, but a closer look will reveal many common defects in one.

Quality DOESN'T COST... IT Pays!

After finished costs are compiled, then and only then can you evaluate the quality of a steel casting. Basic cost alone is no "yardstick" for value when accuracy, soundness and other qualifications necessary to economical processing, are not included. Excessive machine work . . . or ultimate rejection due to hidden flaws, can skyrocket finished costs.

Consistently high quality is not achieved by guesswork. Unitcast meets all customer specifications with experience and equipment second to none! Every facility is employed for a specific purpose . . . with a single objective, to deliver the best quality steel castings at the lowest possible price.

Unitcast will assure you "value received". Write or call today! No obligation.

UNITCAST CORPORATION • Toledo 9, Ohio

In Canada: CANADIAN-UNITCAST STEEL, LTD., Sherbrooke, Quebec

Unitcast



QUALITY
STEEL
CASTINGS

two outside the range are rejected.

These standard sets of rocker arms are kept for each make of car to set up the electronic hardness tester for a production run and to check them periodically.

Certain rocker arms must meet these specifications:

Limits	Pass	Reject
Soft side	4.7 mm dia	4.8 mm dia
Hard side	4.2 mm dia	4.1 mm dia

MATERIAL ANALYSIS

Carbon	2.60
Silicon	1.35 - 1.40
Manganese	0.40
Sulfur	0.115
Phosphorous	0.05
Chromium	0.02

Extreme care must be used in the selection and use of the standard rocker arms to set the machine up. This is still a magnetic comparative method of testing the hardness of rocker arms and no better job can be done by the "Electronic hardness tester than the care and accuracy used to obtain 'testers.'"

Some problems that gave difficulty was shielding the amplifier from stray magnetic fields, and line voltage fluctuations. These were solved by using one inch steel plate for shielding, isolation transformers, and electronic voltage regulators.

Brass tubes were originally used. They gave considerable trouble because of wear and also retained some magnetism. Stainless steel was tried which was originally non magnetic but after a million or so operations became magnetic. Just why we do not know unless it was by the constant pounding of the rocker arms as they were pulled into position by the magnetizing coil. This problem was overcome by using plastic tubing.

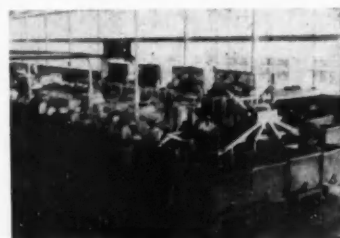


Fig. 2—Central Foundry's battery of eight electronic hardness testers.

The four girls in the background (see Fig. 2) drop rocker arms through eight "Electronic Hardness Testers" checking the hardness of approximately 20,000-rocker arms per hour (see accompanying table). The "good" rocker arms go up an inclined conveyor, dropping through a demagnetizing coil into a hopper where they are inspected and sorted. These in-

New General Electric heavy-duty press motor requires less maintenance, reduces downtime

NEW VENTILATION SYSTEM, RUGGED CONSTRUCTION ASSURE LONGER LIFE WITH G-E TOTALLY ENCLOSED MOTOR

The new General Electric Type KRX induction motor, designed specifically for punch presses, requires less maintenance and no troublesome accessories. Because the KRX is a true totally enclosed fan-cooled motor, there are no filters to change or clean, no separate blowers necessary. You can install it and forget it!

BUILT TO GIVE YEARS OF SERVICE without major maintenance, this motor is industry's toughest press motor. Longer motor life is assured for three reasons:

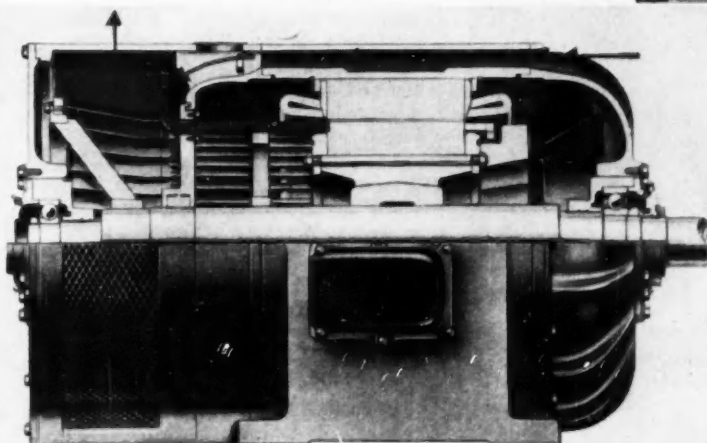
1 Insulation is less susceptible to damage by overload because rotor heat, normally generated inside the motor enclosure, is dissipated externally by a highly-effective radial fan.

2 Positive totally enclosed construction and rotating labyrinth seals protect the motor from dirt and the oil-laden air of press rooms.

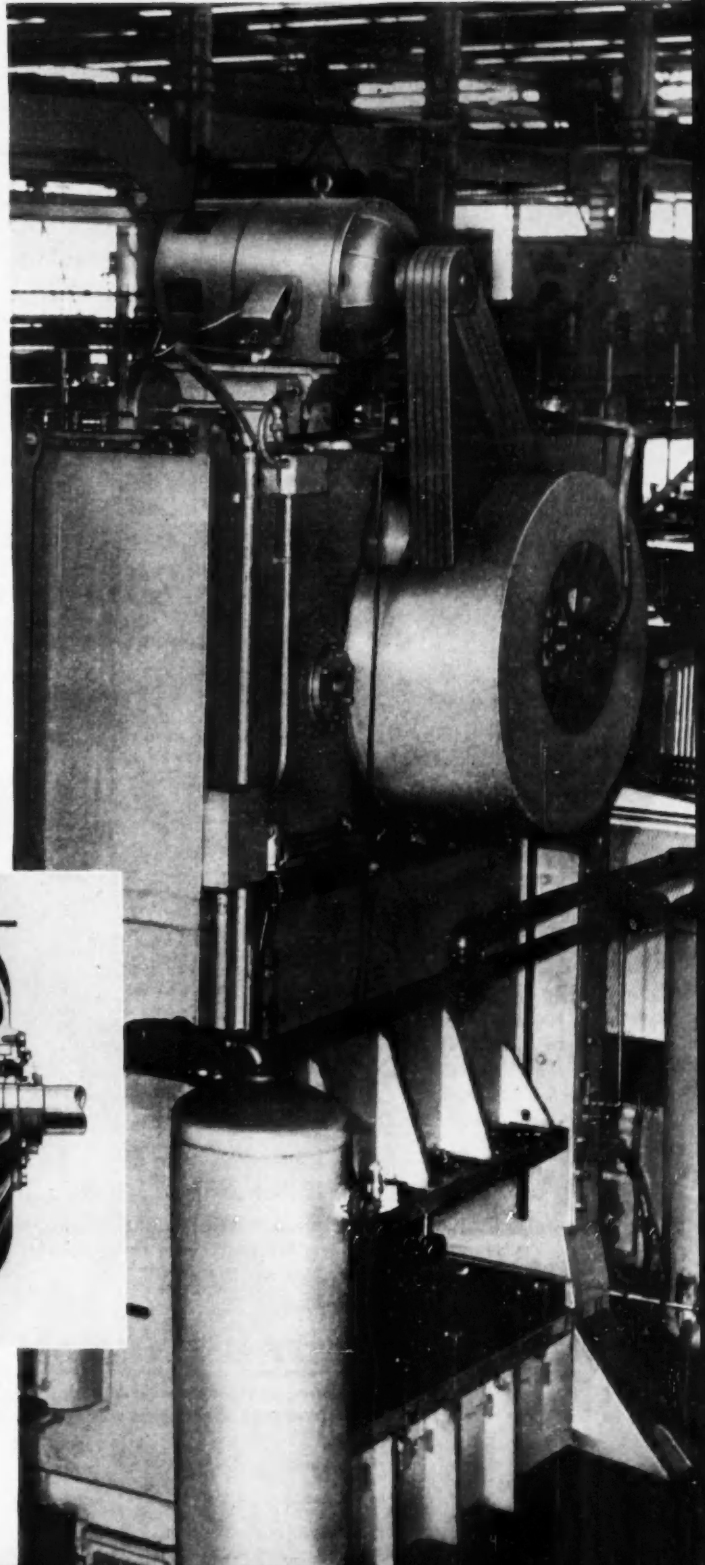
3 Rugged one-piece, cast-iron frame, rigidly bolted end shields, and sturdy rotor construction provide protection against the shock, vibration, and abuse encountered in press work in the automotive and metal-working industries.

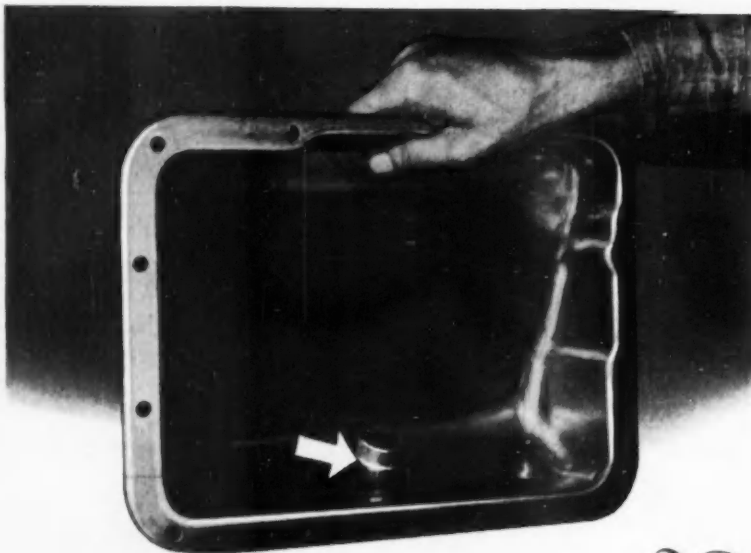
FOR MORE INFORMATION on General Electric Type KRX motors consult your G-E Sales representative, or write for Bulletin GEA-5968 to General Electric Co., Section 830-10, Schenectady 5, New York.

GENERAL  **ELECTRIC**

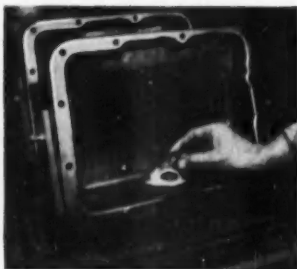


EFFECTIVE COOLING SYSTEM of KRX motor is indicated by arrows showing passage of air across motor and fan blades. Bulk of rotor heat is built up in external fan *outside* stator assembly.



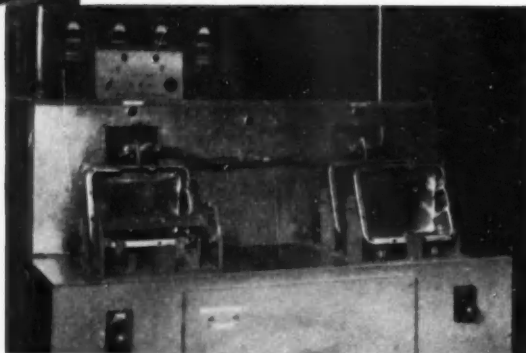


A prize recipe FOR BRAZING SPUDS



Pans with spuds and EASY-FLO rings are placed in fixtures of 2-station induction heating unit. Brazing two at a time, production is 400 an hour. Under a 100-lb. torque test "the pan pulls apart first."

The principal ingredient is the low-temperature silver brazing alloy EASY-FLO. You simply place the spud in position with a ring of EASY-FLO wire around it, apply flux and heat. Logan Machine & Metal Stamping Co., Akron, Ohio, get excellent results with this recipe in brazing spuds in the oil pans that are part of an automatic automobile drive. Photos show how they do it.



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spectors in turn drop rocker arms through tubes onto a conveyor that carries them to their proper hopper where they are ready for shipment to our customers.

ROCKER ARM TESTING AT CENTRAL FOUNDRY

Year	No. of Rocker Pieces Shipped per Year	Man Hours per Year for Old Method of Checking Hardness	Man Hours per Year for New Method of Checking Hardness	Saving in Man Hours per Year New Method
1950	36,883,776	73,800	7,300	66,500
1951	38,568,841	73,000	7,300	65,700
1952	35,771,089	71,500	7,150	64,350
1953	50,570,143	101,500	10,150	91,350

Old Method—500 Rocker Arms/M. H.

New Method—5,000 Rocker Arms/M. H.

60 people required/shift to do what six people do checking hardness electronic.

Quality Control

(Continued from page 71)

temperature. Valve lash adjustments are made at the start of the test, then finalized at the completion of the run. At the same time, the inspector checks for noise with a stethoscope at certain critical points.

In addition to this routine procedure, IHC has established a dynamometer laboratory, under the supervision of the inspection department to provide a check on inspection in the shop and on the assembly line. About 12 engines a week are taken off the end of the assembly line at random, subjected to a full test run for 25 hours to determine conformity to performance specifications. The sampled engines are first given a break-in run for eight hours, then a full test schedule for 17 hours. At the end of the test period, each engine is torn down completely for measurement and visual inspection of individual parts.

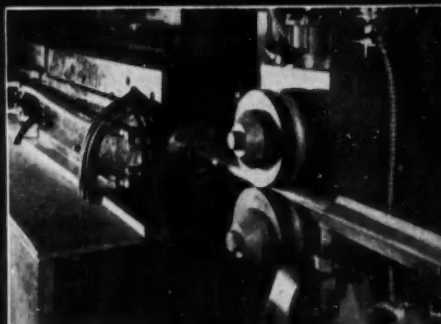
The dynamometer laboratory also provides a means of production testing of parts supplied by new vendors as well as parts newly brought in by engineering. Some of the endurance tests on such new parts may be extended to run for 100 hours or more.

AUTOMOTIVE INDUSTRIES...

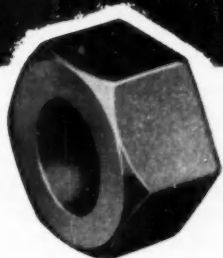
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4200 Nut Blanks Per Hour



Feed rolls push barstock through TOCCO Induction Coils to heat stock to 2350°F for forging.



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FASTER PRODUCTION—4200 nut blanks per hour—twice the output of a conventional hot punching machine—that's the result of Lamson & Sessions Company's new automatic production set up with TOCCO Induction Heating.

OTHER ADVANTAGES—TOCCO delivers exact temperatures (2350°F, plus or minus 25°) and delivers them so fast that scale has little time to form. Scale loss has been reduced to only about 1% for hot-rolled stock. TOCCO is clean and cool, fits right into the production line—no hauling to and from the heat-treat department—no unpleasant radiant heat to annoy workers.

HERE'S HOW IT WORKS—Steel bars up to 1½" diameter are fed through TOCCO Induction Coils. The first two coils, operating off a 300 kw, three kc TOCCO motor-generator set, preheat the rod. The third

coil which operates from a TOCCO 250 kw 10 kc generator then boosts the rod to forging temperature. The hot rod then is fed to the special hot nut former (designed and built by NATIONAL MACHINERY CO.) which shears the rod to suitable lengths, forms the part and spits out the nut blank—ready for tapping.

In your search to find sound methods of increasing production, improving products and lowering costs, don't overlook TOCCO Induction Heating. If your products require heat treating, soldering, brazing or forging, it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit costs.

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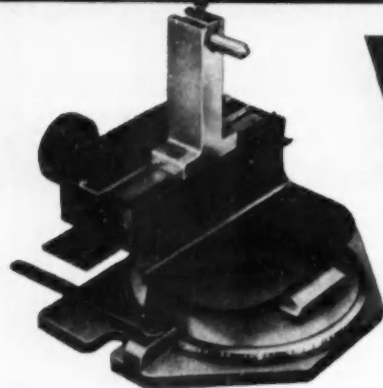
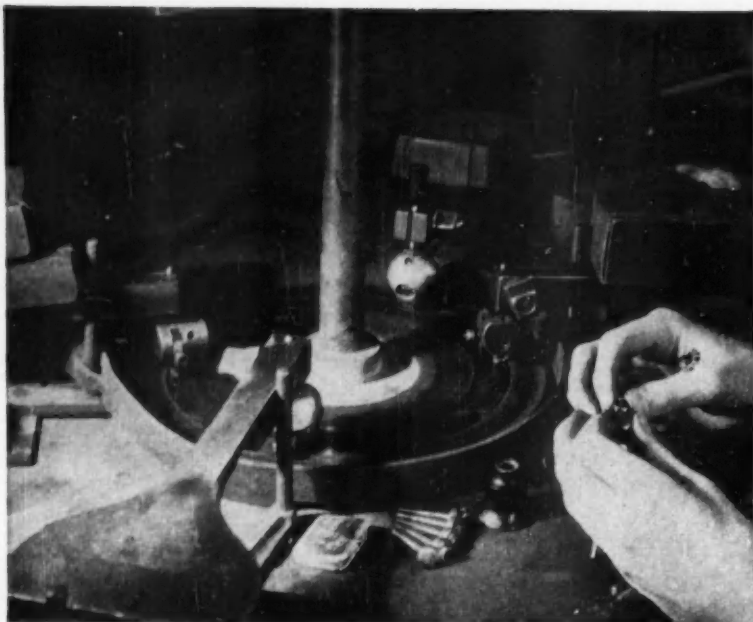
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In 1953 there were 6,121,787 passenger cars and 1,206,253 trucks and buses produced in the U. S. The combined 7,328,040 vehicles had a wholesale value of almost \$12 billion.

Since 1900 the automobile industry has built 136,010,743 motor vehicles with a wholesale value in excess of \$126 billion. Of this total, more than 50 million are still registered for service.

At the end of 1953, the automobile industry employed 893,500 people, of which 731,800 were employed in actual production.

Last year, 333,382 men were employed on Federal and State highway construction and maintenance.

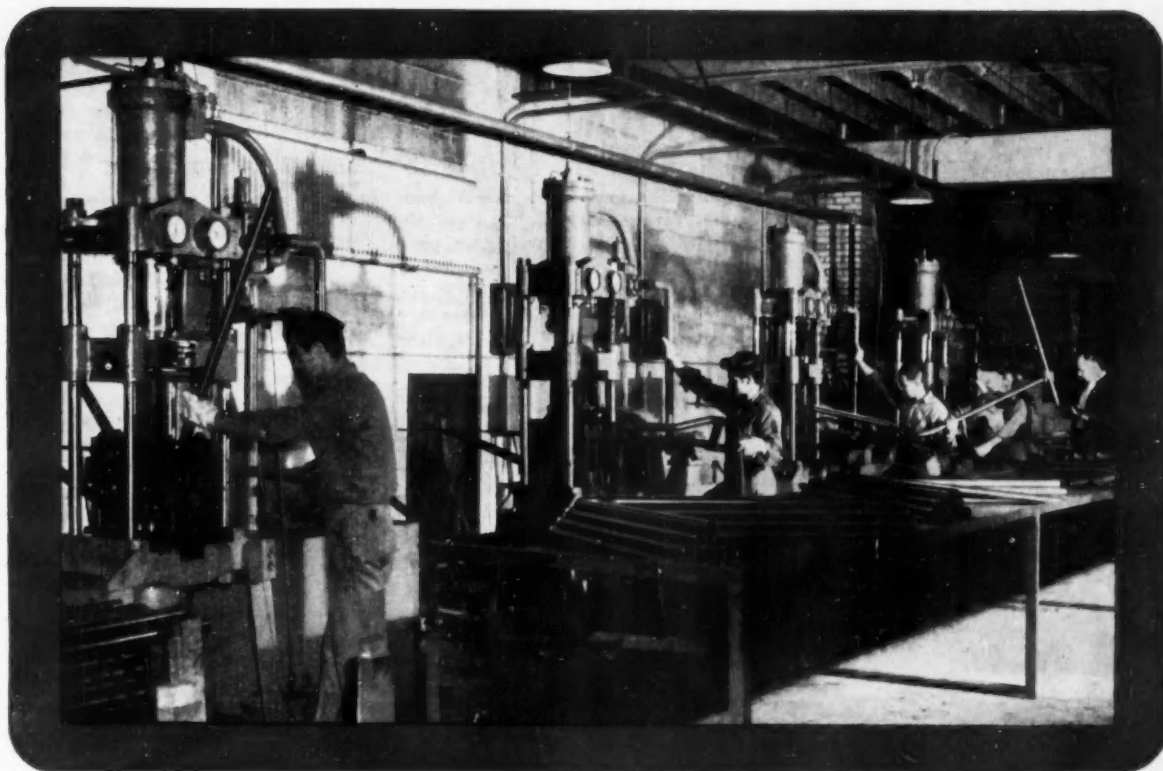
Motor vehicle taxes set an all-time high record in 1953, with a total of \$5.725 million.

The U. S. motorist burned 49.5 billion gal of gasoline last year. He also bought some 55 million replacement tires and 36 million replacement tubes.

To test special-purpose tubes used in aircraft electronic systems, the manufacturer freezes them at -65 F, cooks them in 200 F heat; and gives them landing impact shocks every 10 seconds for 200 hours. The tubes have a life expectancy of 3500 hours.

In the two-minute flight of a test missile, instruments aboard frequently transmit to the ground as many as 60,000 readings.

A turbine control, developed to solve fuel metering problems in jet aircraft, can solve the equivalent of 100 complex computations per minute.



BENDING TUBING INTO TAILPIPES...

another job done better, faster
on **ELMES** Hydraulic Presses!

Four 20-ton hydraulic tube benders—one of many types of Elmes Presses built for special metalworking jobs—are shown above in operation at James Steel and Tube Co., Hazel Park, Michigan. Automobile tailpipes, each requiring seven bends, are produced at the rate of 2000 complete units per eight-hour shift.

These small but heavy-duty, high production Elmes Presses are designed especially for bending tubing into automotive exhaust and tailpipes. Their performance has been so outstanding—affording substantial savings

in time, effort, maintenance and money—that they are now widely recognized as the logical "first choice" among presses used for this application.

Whether your metalworking press requirements call for special purpose designs, or can be met with standard production equipment, you'll find it always pays to "put your pressing problems up to Elmes." Many others have found it profitable . . . in terms of gaining *press performance at its best!* Ask Elmes engineers to assist you. Recommendations and cost estimates supplied promptly.

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National Plastics Exposition

(Continued from page 59)

showed a variety of products made of its latest laminating and molding materials.

A recently developed material, Resinox 3700, a special thermoset, was brought out at the Monsanto Chemical Co., Plastics Div., Springfield, Mass., exhibit. This material is said to give superior performance at low cost in such items as magnetos

and motor controls. It is a mineral filled material.

Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y., gave its new Durez 16221 high-impact phenolic molding compound reinforced with glass fiber a special spot at its booth. Durez claims it is suited wherever long, hard wear is a requirement.

Allen Tool Co., Springfield, Ohio, had an interesting exhibit of cast and reinforced plastic dies, tools, jigs, and other equipment.

Presses

Hydraulic equipment for the plastics industry was the subject of the Elmes Engineering Div. of American Steel Foundries, Cincinnati, Ohio, booth. This company had on display a press for reinforced plastics molding which was of interest. Presses of this type are available in capacities from 50 to 300 tons.

Another interesting exhibit of presses was contained in the Erie Engine & Manufacturing Co., Erie, Pa., space. This company has built quite a few units for the manufacture of the Chevrolet Corvette. A new product displayed was the preform machine for reinforced polyester products.


Reeves Pulley Co., Columbus, Ind., had a complete line of variable speed drives in operation. The horsepower range of the equipment varied from the fractional category to 87 hp.

Industry Principles

Just prior to the show, C. B. Branch of Dow Chemical Co. announced that 452 member companies of the SPI have signed the recently prepared Statement of Principles of the Plastics Industry. This statement has four basic points, which are:

1. To "understand thoroughly the properties and limitations of all plastic materials handled by us."
2. "Apply the correct plastic materials to all industrial end uses, designing and engineering them for maximum value, performance and safety."
3. To "use great care to select the correct plastic materials for all consumer items, designing them and engineering them to insure value, satisfaction, safety and pleasure to all users."
4. To "sell plastic materials, and all industrial and consumer items made therefrom, on the merits of the materials, application and design, and free of extravagant, insupportable claims."

The SPI also announced that three film strips have been prepared by the Society to educate the public concerning plastics and plastic products. The three categories cover business, home, and a general program designed for high school and college students.



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MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Fig. 1. Details of arbor construction and location of 22 cutting tools.

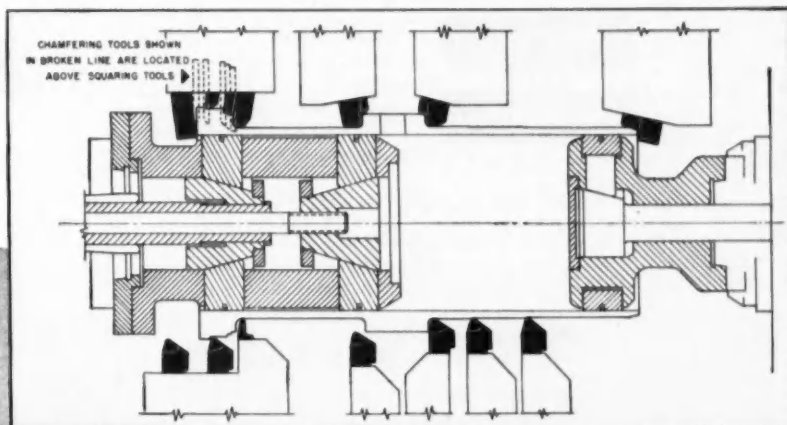
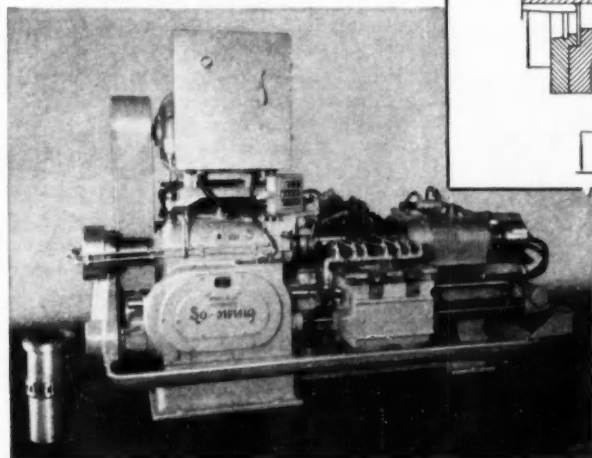


Fig. 2. Model R-18 Lo-swing Lathe equipped for machining large cylinder liners.



MODEL R-18 AUTOMATIC Lo-swing LATHE MACHINES LARGE CYLINDER LINERS AT FAST PACE

Problem: To turn outside diameters, face shoulders and chamfer large cylinder liners 11-1/2" diameter by 22" long.

Solution: The large swing Model R-18 Automatic Lo-swing Lathes selected for this job were equipped with special tailstocks and tooling engineered for this particular job.

The work is held and driven by a special driver, mounted on the headstock spindle, which has two rows of six, air-operated driving jaws. Each row is operated by its individual pull bar (Fig. 1) thus equalizing the air pressure on both sets of jaws. In order to avoid distortion and provide increased support, both sets of jaws grasp the work piece where the wall thickness is greatest.

The relieving type tailstock has a 20 inch

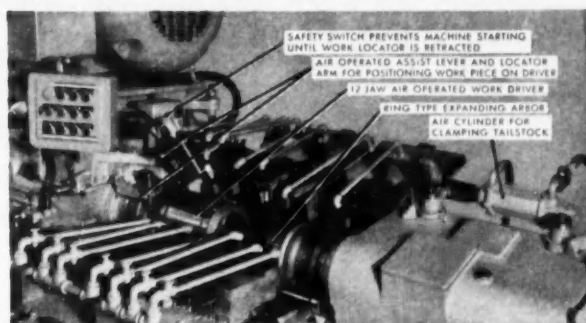


Fig. 3. Close-up view of special tooling and tailstock.

stroke, operated by a motorized lead screw, permitting easy removal of the cylinder sleeves from the long driver. Its large revolving spindle is fitted with an air-operated, ring type expanding arbor which supports the work at the tailstock end.

The work is located in relation to the ports previously cut around the liner body by a locator arm (Fig. 3) which enters one of the ports when swung downwards. The operator then positions the piece on the driving arbor with an air-operated assist lever which holds it tight against the locator until the driving jaws grasp it. A safety switch above the locator arm prevents the machine being started with locator in engaged position.

A 60 HP motor drives the machine. Floor to floor time is 5.2 minutes, demonstrating the substantial economies possible with Lo-swing methods. Let Seneca Falls engineers assist with your turning problems.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

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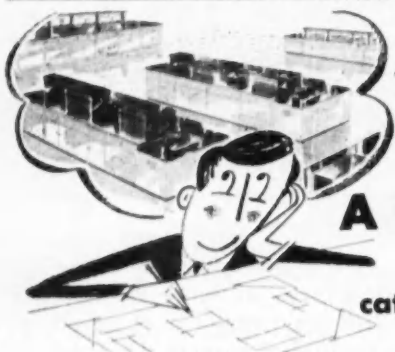
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METALS—

(Continued from page 96)

ready to take lead for forward delivery at a fixed price rather than at the average price prevailing during the week.

General Services Administration asked for offers of lead and zinc for the stockpile to be made by June 10 for the current fiscal year. This presumably will be followed by another purchase directive for the 1955 fiscal year which begins July 1. The Government has not disclosed tonnages to be bought, apparently to avoid disturbance in the market. It has specified, however, that metals offered must be produced from domestic ores subsequent to April, 1954. Hence smelters who have big stocks of metal processed from foreign ores will get no direct help from Government buying. Obviously the purpose of the re-animated stockpiling policy is less to increase metal stocks, which are known to be adequate, than to aid the hard-hit domestic lead and zinc miners who have been complaining bitterly to Congress of low prices.

Higher Tariffs Advocated

According to common report, the Tariff Commission recommended that the President boost lead-zinc import duties to the maximum allowed under the "Escape Clause" of the Tariff Law. This would raise the duty on lead from 1.06 to 2.55 cents per lb, or about 150 per cent, and zinc slab from 0.7 to 2.1 cents, or 200 per cent. The President has until July 20 to act. A flood of protests over this proposed action has come from foreign producers, which places the Administration on a very hot spot, in view of its stand on free trade legislation in Congress. Nevertheless, tremendous pressure is being placed for approval by western Congressmen.

Devaluation of the Mexican peso by 40 per cent has added more fuel to the demand for higher zinc and lead tariffs. This action has reduced the dollar cost of production in Mexico, and permits Mexican producers to offer the metals more advantageously in this country. However, it is questionable how long this advantage will last before wage and supply costs catch up across the border.

Disappointing Zinc Figures

It was generally believed that the relatively encouraging record of zinc
(Turn to page 123, please)

AUTOMOTIVE INDUSTRIES, July 1, 1954



PROPERTY AND APPLICATION DATA ON THESE
VERSATILE ENGINEERING MATERIALS: "ZYTEL,"
"ALATHON," "TEFLON," "LUCITE."

NEWS

NO. 4

1954

Gears of Du Pont "Zytel"* Successful in New Packard Ultramatic Governor Drive Assembly

POINTERS ON PROCESSING

TEFLON® is readily fabricated by various methods



Several techniques have been developed for rapid fabrication of Du Pont "Teflon" into various shapes.†

One new extrusion method permits mass production of parts with section thicknesses as low as 5 mils, or as high as ¼ of an inch. This process is ideal for producing tape, tubing and wire insulation. And it can readily be adapted to the manufacture of monofilament and irregular shapes.

The new process is a simple one, requiring only four easy steps:

A composition of Du Pont "Teflon" is preformed by compression, then placed in a ram-type extruder.

The composition is ram-squeezed through a die to produce the desired shape. The extrusion aids are removed from the shaped part by volatilization. The part is then sintered and quenched.

Laboratory tests show that, by the above method, ½"-diameter tubing of "Teflon" can be extruded at 10 feet per minute. Production speed increases as the tubing diameter decreases. Also, a 15-mil insulation has been extruded on Number 16 AWG copper wire at 12 feet per minute.

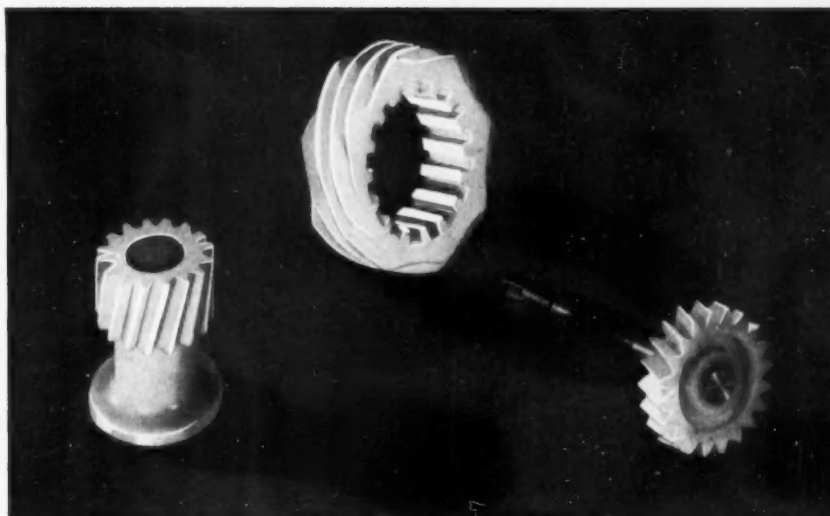
Even with such production speeds, shapes of "Teflon" made by the above process have the excellent physical and dielectric strength characteristics for which "Teflon" is noted and which no other material can match.

There are alternate methods of fabri-

†Conventional molding and extruding techniques for plastics are not applicable to "Teflon" because it does not melt and flow. Nor can it be dissolved.

(Continued, column 2 back side)

Gears of Du Pont "Zytel" nylon resin show no signs of wear after 48,463 mile road test



Component gears molded of "Zytel" nylon resin used in Packard Motor Car Company's Ultramatic Drive include: transmission governor pinion, speedometer driving gear and speedometer driving pinion. These gears of "Zytel" showed no perceptible signs of wear after a 48,463 mile test at Packard Proving Grounds. Gears molded by MacDonald Manufacturing Company, New Baltimore, Mich.

Du Pont "Zytel" nylon resin is used for the transmission governor pinion, speedometer driving gear, and speedometer driven pinion in Packard's Ultramatic Drive as one phase of Packard's new engineering program of research into uses of new materials.

An extensive development program, conducted by Packard and molding specialists, MacDonald Manufacturing Company of New Baltimore, Michigan produced the gears used in the speedometer train. These gears of Du Pont "Zytel" nylon resin are mass-produced in four-cavity dies quickly and at a substantial saving in production costs.

One phase of research involved a 48,463 mile road test on the Packard Proving Grounds. At the end of this run, the gears of "Zytel" showed no perceptible wear.

The development of this application

*"Zytel" is the new trade-mark for Du Pont nylon resin.

for "Zytel" nylon resin came as a result of the successful use of a helical gear of "Zytel" molded on a steel shaft and used as a transmission speedometer pinion.

The use of Du Pont "Zytel" was extended for the following reasons:

"Zytel" runs quietly. Because gears made of Du Pont "Zytel" nylon resin run quietly, they eliminate the need for the extremely close dimensional tolerances which metal gears must have to reduce vibration and noise.

"Zytel" is strong. Gears and parts of Du Pont "Zytel" nylon resin have excellent wear resistance, high impact strength, and superior resiliency.

"Zytel" is lightweight. Packard realized an 87% saving in weight when the gears were made from "Zytel" nylon resin.

"Zytel" reduces costs. These

(Continued, column 1 back side)

OVER



PROPERTY AND APPLICATION DATA ON THESE
VERSATILE ENGINEERING MATERIALS: "ZYTEL,"
"ALATHON," "TEFLON," "LUCITE."

NEWS

NO. 4

1954

Gears of "Zytel"†

(Continued)

gears are precision injection-molded in a multi-cavity die. The injection molding process is rapid and efficient, combining high production rates with low unit cost.

Other uses in the automotive field utilize the unique properties of "Zytel". Typical applications include: windshield wiper motor, light-load bearings and cams, clutch and brake pedal bushings.

For more information about "Zytel" nylon resin, and the other members of the Du Pont family of engineering resin materials—"Teflon" tetrafluoroethylene resin, "Alathon" polyethylene resin, and "Lucite" acrylic resin, clip the coupon.

†"Zytel" is the new trade-mark for Du Pont nylon resin.

Investigate Du Pont engineering materials in your product development programs

One of the family of these versatile engineering materials is often a key factor in product improvement or new product design.

The wide range of properties available with "Alathon"* polyethylene resin, "Lucite"* acrylic resin, "Teflon"* tetrafluoroethylene resin, and "Zytel" nylon resin are helping solve industrial design problems.

NEED MORE INFORMATION?

Clip the coupon for additional data on properties and applications of these Du Pont engineering materials.

Fabrication of "Teflon"

(Continued)

cating "Teflon"; molding, coining, hobbing, and screw-extruding, for example. "Teflon" can also be machined with ease, to tolerances of $\pm .001$ inches.

Write today for further detailed information about these manufacturing techniques. Just fill out and mail the coupon at the left.

Check these properties of Du Pont "Teflon" against your design requirements

Be sure to evaluate the unusual properties of Du Pont "Teflon" tetrafluoroethylene resin. No other engineering resin material offers the unique combination of properties which "Teflon" has:

(1) **Chemical inertness.** Gasoline and oil have no effect whatsoever on "Teflon". In fact, this unique material is inert to every chemical and solvent (excepting only molten alkali metals, and fluorine at high pressures and temperatures).

(2) **Resistance to heat.** "Teflon" is tough, has high impact strength over a wide range of temperatures: from as low as -450°F. , up to as high as 500°F.

(3) **Excellent electrical properties.** The power factor of "Teflon" is less than 0.0005, up to 30,000 megacycles, highest frequency tested. It has good arc resistance, as arc leaves no carbonized path.

In addition, "Teflon" tetrafluoroethylene resin has zero moisture absorption by A.S.T.M. test D570-42. It lasts outdoors for years without weathering effect. It can be fabricated readily into tape, coating, sheets, rods, tubes or molded parts.

New flashlight of Du Pont "Alathon" is virtually unbreakable

Here's a new twist in flashlight case design. It's a flashlight with battery section, end cap and lens retaining ring all molded of Du Pont "Alathon" polyethylene resin. Results: lighter weight,



Three flashlight parts of Du Pont "Alathon." Gits Molding Corporation, Chicago manufacturer, guarantees it unbreakable in normal use.

extra strength, resiliency, resistance to corrosion, and excellent dielectric properties.

Breakage Virtually Eliminated

Du Pont "Alathon" combines lightness with strength and resiliency. If the flashlight should be dropped accidentally, there is no danger that the screw connection or case will be permanently bent and made useless. "Alathon" cushions blows so well that it even protects the bulb filament from damage by shock. The flashlight manufacturer, Gits Molding Corporation, Chicago, Ill., has thoroughly tested the case of "Alathon" and guarantees it unbreakable, if not wilfully abused.

"Alathon" is Durable

"Alathon" offers other advantages, too. It resists corrosion, so the flashlight case will not be attacked by gasoline or petroleum products, nor will contact with water rust it. What's more, the parts of "Alathon" form a water resistant seal.

Du Pont "Alathon" has excellent dielectric properties. Contact points leading to the flashlight switch do not have to be insulated, as "Alathon" itself is the insulation.

E. I. DU PONT DE NEMOURS & CO. (INC.)
Polychemicals Department
Room 177, Du Pont Building, Wilmington 98, Delaware

Please send me more information on the Du Pont engineering materials checked:

☐ "Zytel"; ☐ "Alathon"; ☐ "Teflon"; ☐ "Lucite". I am interested in evaluating these materials for:

NAME _____ POSITION _____

COMPANY _____

STREET _____

CITY _____ STATE _____

TYPE OF BUSINESS _____

*"Alathon", "Lucite", "Teflon" are registered trade-marks of E. I. du Pont de Nemours & Co. (Inc.).

METALS

(Continued from page 120)

in March and April would be repeated in May. Instead, smelter shipments to users both here and abroad declined, while stocks of unsold metal mounted over 9000 tons during the month, to total 209,828 tons, the highest figure recorded for 7½ years.

Equally disconcerting was the increase in smelter production, in spite of previous widespread announcement in mine and smelter cutbacks in an effort to cut down top-heavy stocks. The best explanation is that some of the smelters, in anticipation of Government buying, had failed to reduce output, believing that such purchases would permit them to dispose of a larger proportion of their output.

Some comfort was derived from an increase in unfilled orders at the end of May, which were reported at 38,624 tons, up nearly 7000 tons over April 30. This is the highest figure for almost a year, and suggests that much of the buying was for delivery in later months. An improved rate of ingot steel production has also heartened zinc producers, particularly those who sell to galvanizers.

Copper Situation Satisfactory

By mid-June the copper situation, in sharp contrast with most other non-ferrous metals, was rather definitely tight. The metal appears likely to continue in short supply for some time and the price structure remains firm at 30 cents per lb. With the Government taking delivery of 100,000 tons of Chilean copper for the stockpile, a sharp reduction in foreign stocks is expected. Pressure of Chile metal on the world market has been relieved and that country has been successful as well in selling copper to Europe.

Deliveries of copper by fabricators for the first four months of the year averaged 98,600 tons per month, off about 20 per cent from the same period of 1953. The foresight of producers in cutting back output promptly at the start of the year undoubtedly prevented a serious situation that would have resulted had production continued unchecked.

Producers have recently taken steps to prevent any squeeze in supplies. Kennecott Copper has increased output by 5000 tons per month, thereby cancelling out half of its former cutback. Anaconda has placed its Chilean mines back on a six-day week,

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EVERYONE
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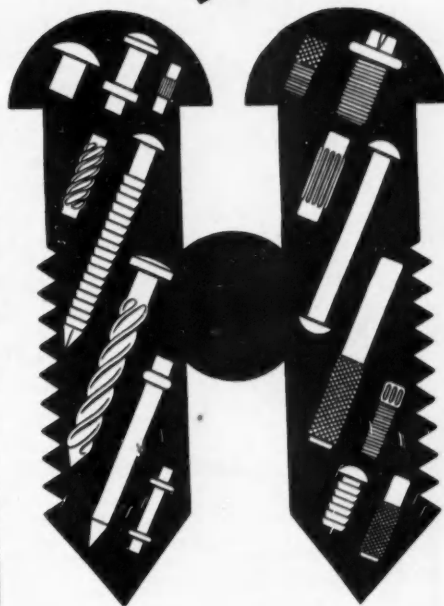
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adding another 2600 tons to monthly production.

Brass Business Improves

While brass manufacturers are not chalking up new sales records, they report a steady increase in orders. Wire mills similarly are recording better business. Some seasonal let-down is expected in the July vacation period, normally a slow period.

The price of copper scrap has weakened slightly and custom smelters report a heavier intake. Buying from abroad is less urgent.

No Third Round Aluminum Program

Aluminum output totaled over 125,000 tons last month, highest on record. This apparently was enough to quiet the Government's anxiety and plans for a third round expansion have been abandoned.

It now appears that military demands for aluminum for planes will be less than expected. Substantial imports of primary aluminum from Canada will be allowed from Aluminum Ltd. to total over 600,000 tons, extending over a six-year period. This metal would be made available to non-integrated American users who

lacked facilities for smelting ingots.

While new domestic aluminum companies can still obtain federal tax benefits to assist in financing plant construction, they will be looking in vain for such special help as long term Government purchase contracts or guaranteed private loans.

Texas Tin Smelter to Continue

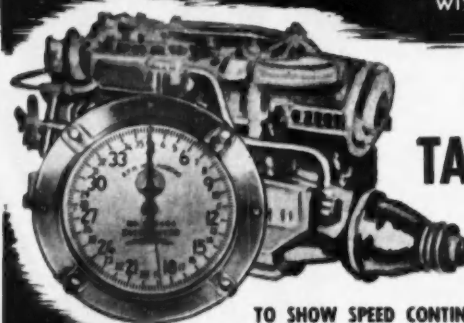
While there is no shortage of tin imminent in this country with the Government stockpile imposingly large, tin users will probably be relieved by the Senate's vote to keep the Texas City tin smelter operating for another year. From political as well as economic motives Washington is negotiating for purchase of about 12,000 tons of Bolivian concentrates for delivery to the smelter over the next year at market price, now about 93 cents per lb. With the Far Eastern situation so unsettled, it appears good insurance to acquire a supply of tin nearer home.

Adoption of the International Tin Agreement by the principal producing and consuming countries (outside of the United States) is now virtually assured. The agreement is designed to stabilize world prices and supply through operation of a buffer pool.

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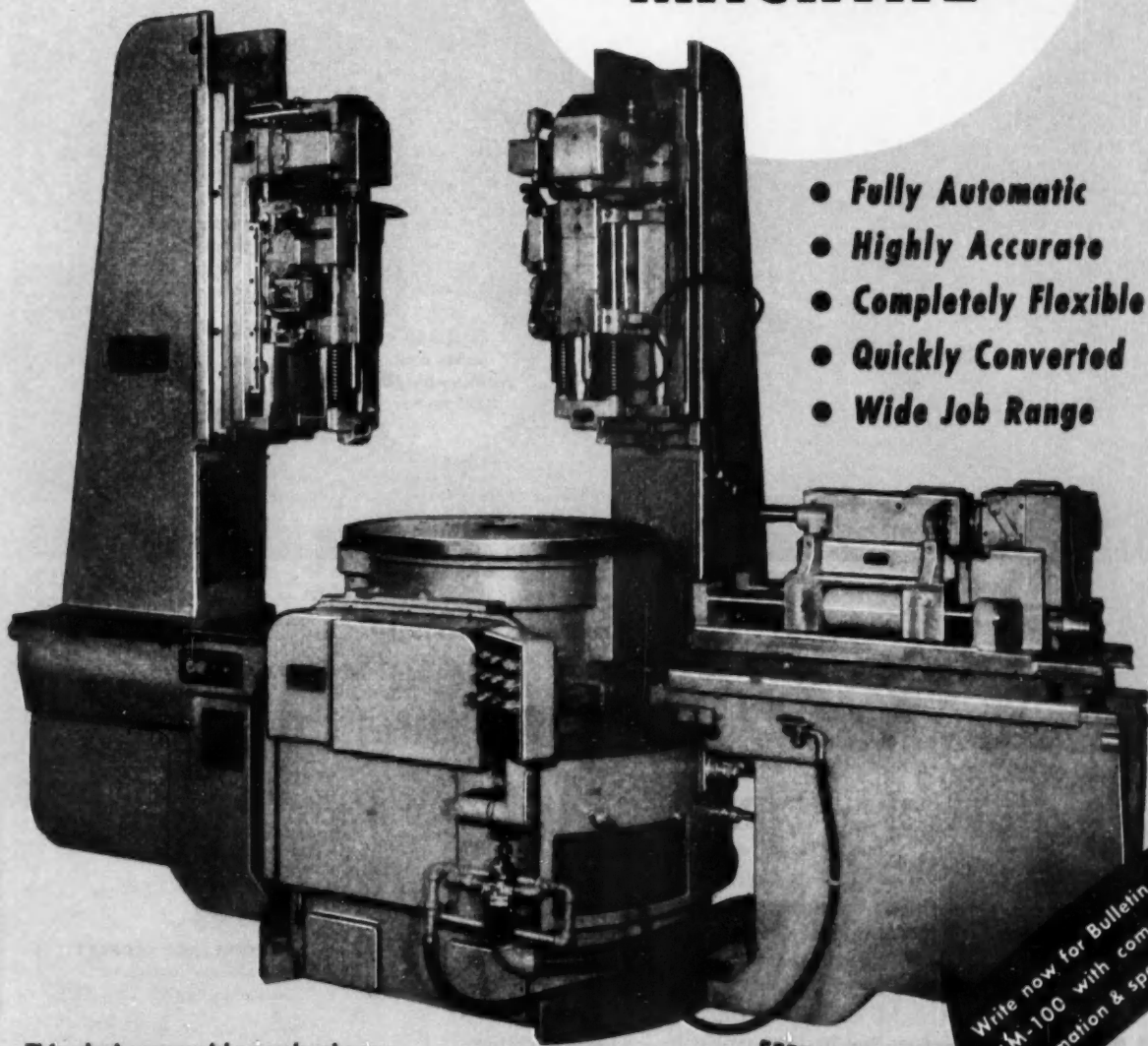
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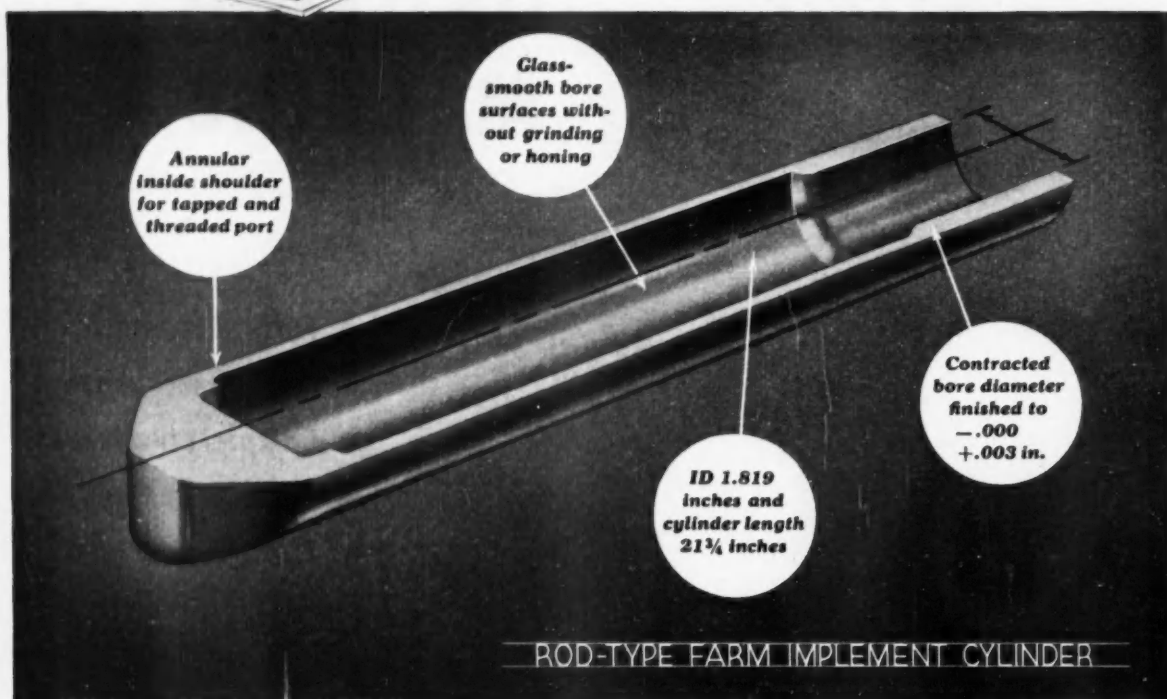
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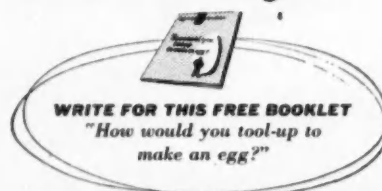
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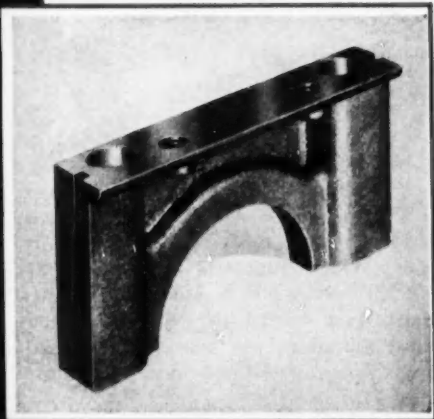
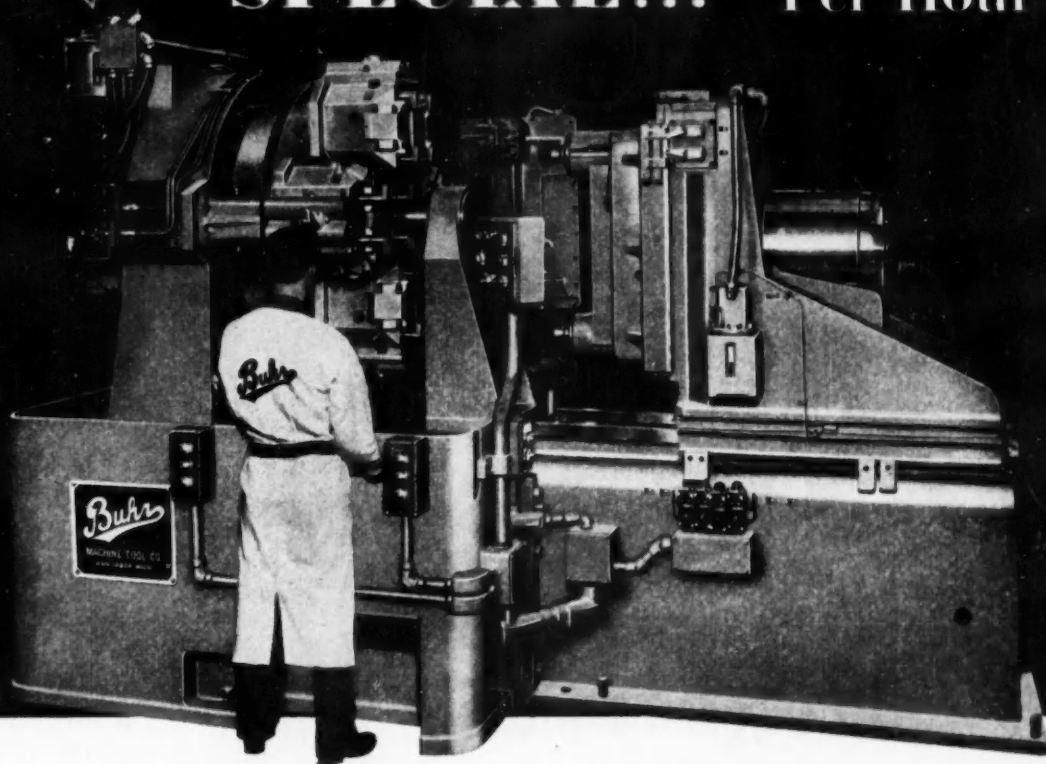
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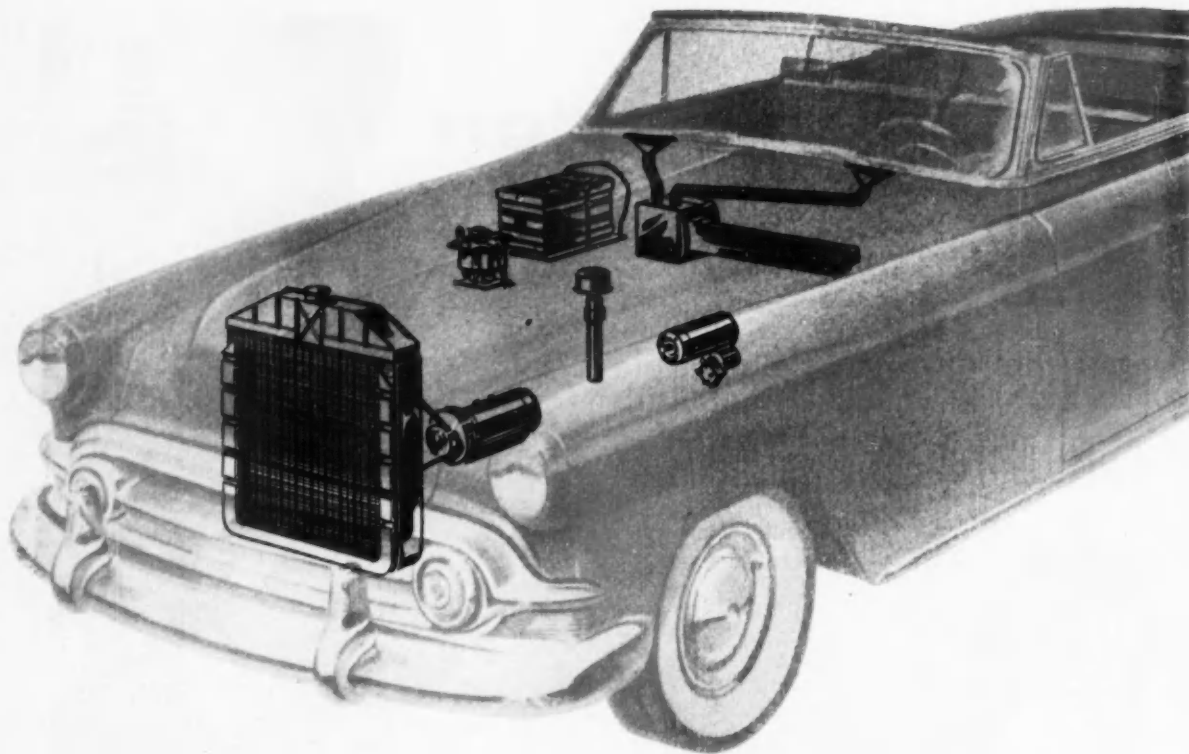
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from Hydrazine, improved soldering fluxes

A remarkable new series of soldering fluxes has been developed by McCord Corporation, one of the largest builders of automotive radiators, refrigeration and air conditioning surfaces, that makes possible greater economy and efficiency in production of soldered components.

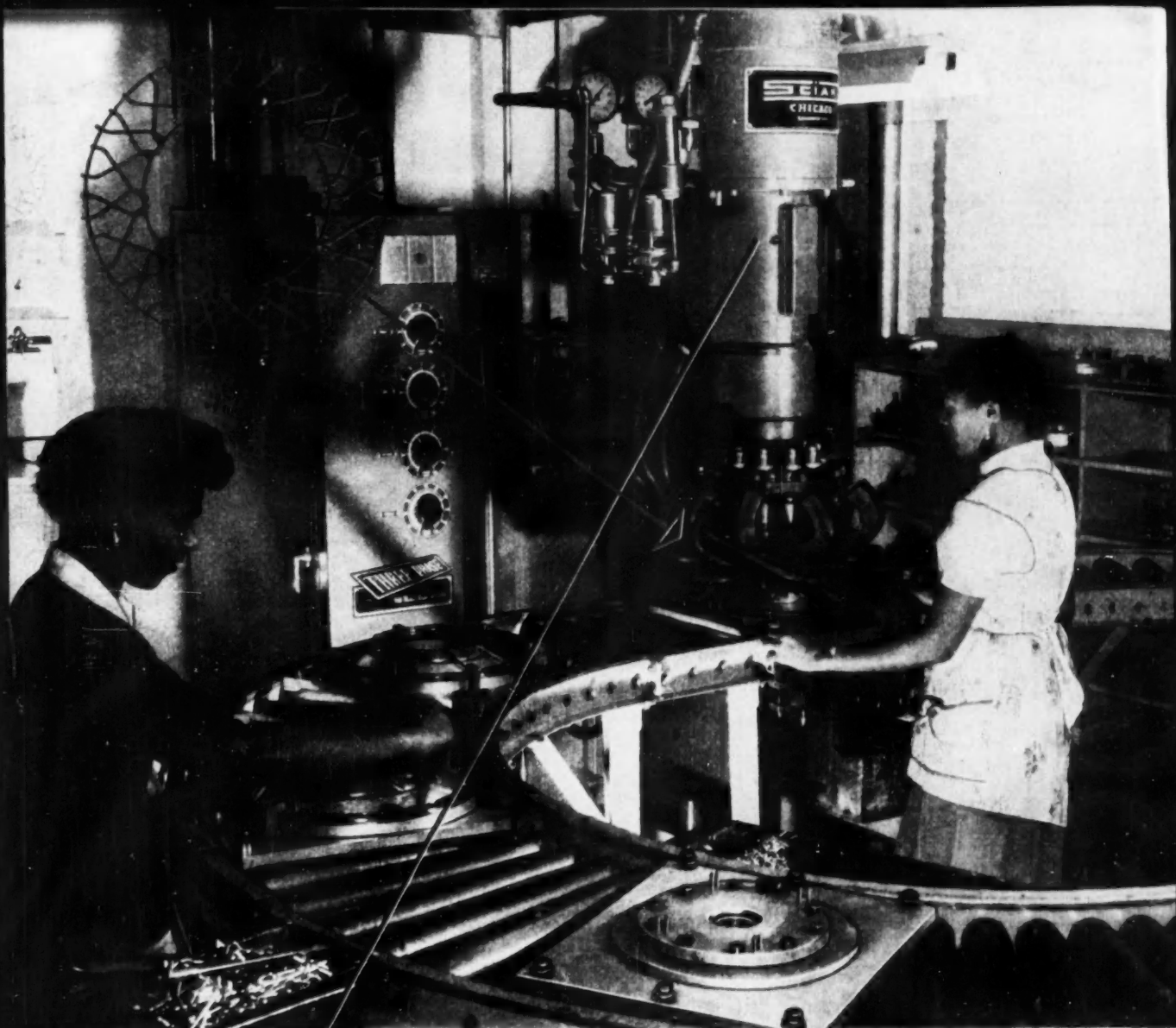
Based on compounds of hydrazine, these fluxes, called CORONIL, are non-corrosive and can be used without hazard. They remove oxides and other films from most of the commercially used metals such as copper and brass—as well as others—to permit more effective work and fewer rejects. Currently, these hydrazine-based CORONIL soldering fluxes are being successfully applied in the manufacture of automotive radiators and other heat exchangers, parts for the electrical and electronic industries, carburetor floats, oil strainers, and various other products where effective non-corrosive soldering is essential.

For additional information on hydrazine-based soldering fluxes, call your nearest Mathieson office or write today.

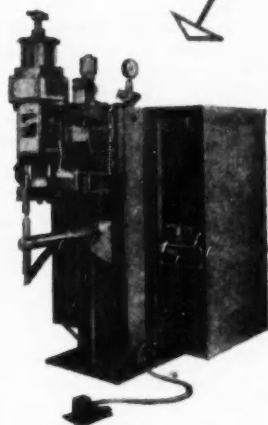


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COMPLEX simulated wire wheels for automobiles are mass produced at Casco Products in Bridgeport, Conn. Only two standard Sciaky patented Three-Phase welders adapted with multiple gun tooling are used. No skilled workers are required to join 40 spokes of .430 stainless steel to the two retainer rings in only four operations. Standard Sciaky welders eliminated cost of expensive special machines. Sciaky Three-Phase suited Casco's limited power facilities, where conventional single phase could not. Sciaky Three-Phase consistency of operation satisfied rigid inspection of alignment and set-down of welds to insure positive fit, and provided smooth fillet welds eliminating special finishing. For complete details, write for R.W.A.W. Vol. 3, No. 9.

Resistance welding of Casco wire wheels is another fine example of Sciaky's basic thinking—welders designed for more useful work at lowest operating cost with maximum reliability.

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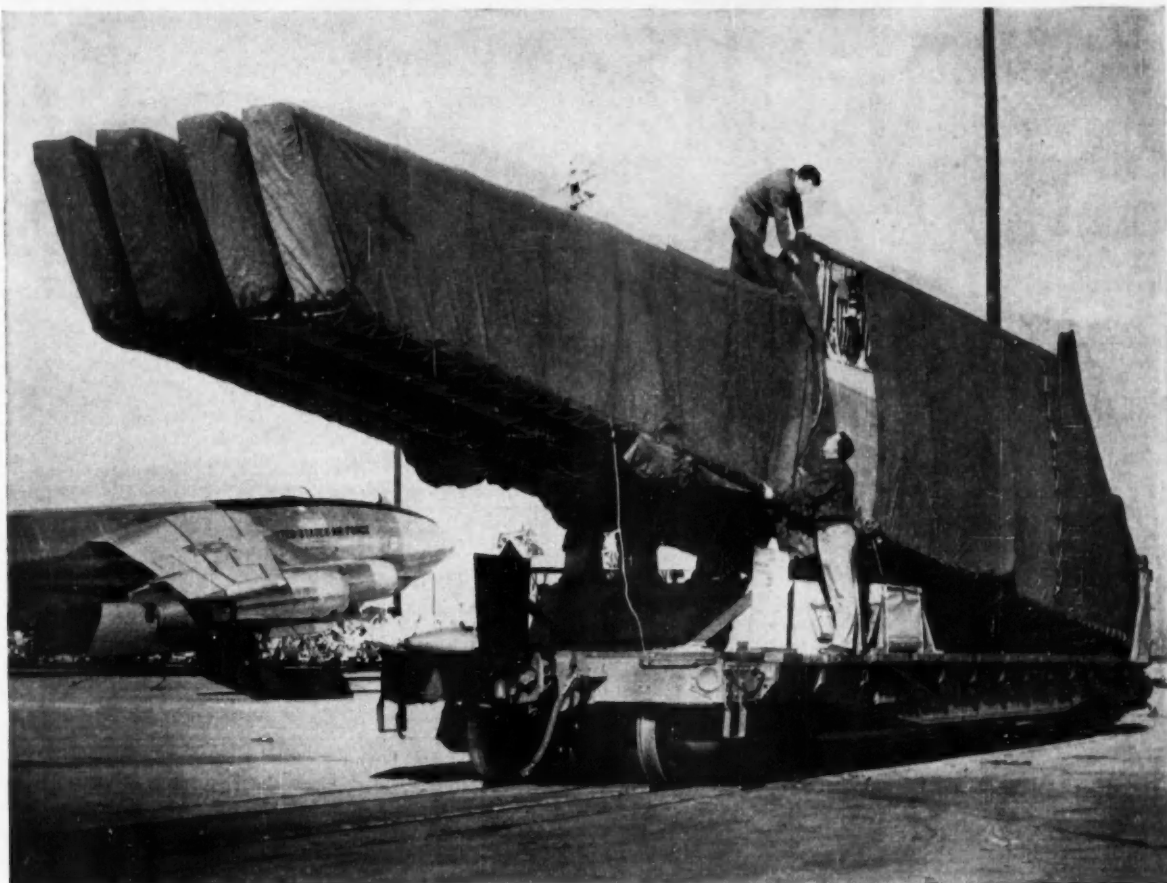
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Another new development using

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B. F. Goodrich Chemical Company does not make these wing covers. We supply only the Geon paste resin.

Cover-up story on Jet Wings

THESE wings for B-47 Stratojet bombers must be protected during rail shipment from sub-assembly plants to the Boeing Airplane Company's Wichita, Kansas, Division. Here's how Geon polyvinyl materials play a part in getting the wings there safely.

The wings are an oversize load, measuring 58 feet. They are shipped 2 pairs to a flat car and must be protected against damage from weather, smoke, soot and abrasion. A plastisol based on Geon paste resin coated over nylon fabric was used by the manufacturer for the special covers designed for this job. As the result, special crating or

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Thanks to the Geon coating, these covers resist the effects of grease, oil, mildew and retard flame. High tensile and tear strength of the fabric and Geon coating have enabled the covers to make more than 70 trips—with more to come!

This use for a Geon material may give you ideas for solving a problem—or developing a product with ready sales appeal. Geon materials have many profitable uses, from upholstery and wire insulation to rigid tubing, sponge

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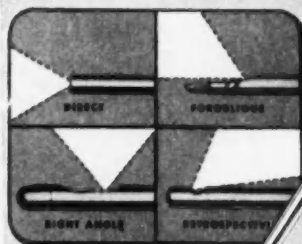
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of internal surfaces
and hidden parts

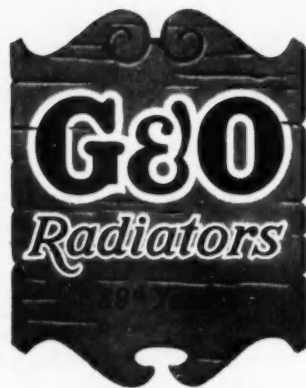


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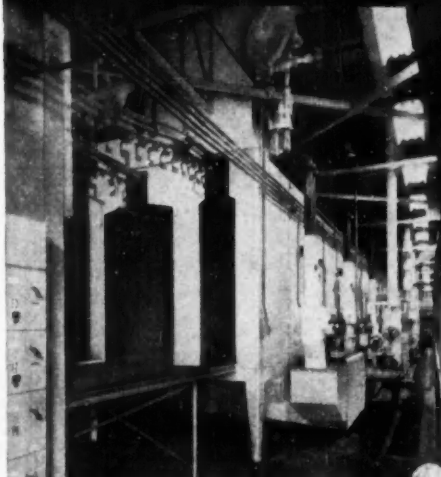
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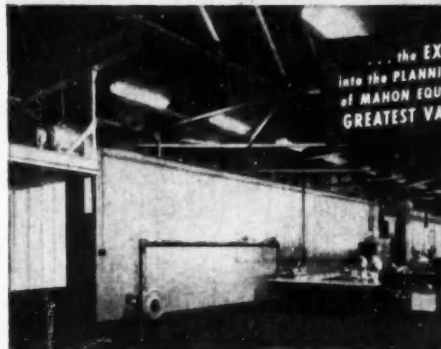
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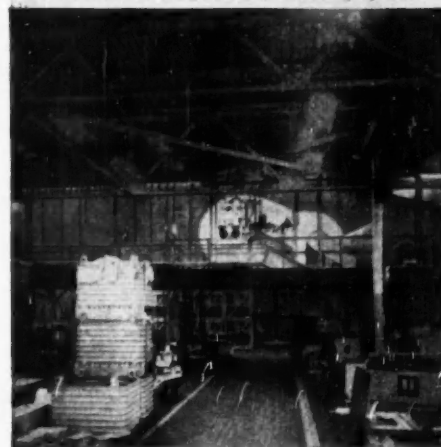
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Exit end of Mahon Five-Stage Metal Cleaning and Rust Proofing Machine. Note two parallel conveyor lines pass through this unit.



Mahon Dry-Off Oven and entrance and end of Mahon Cooling Tunnel which reduces time-length between Oven and Spray Booths.



The Mahon Direct Gas-Fired Finish Baking Oven in this installation is located overhead to permit 100% use of floor space below.

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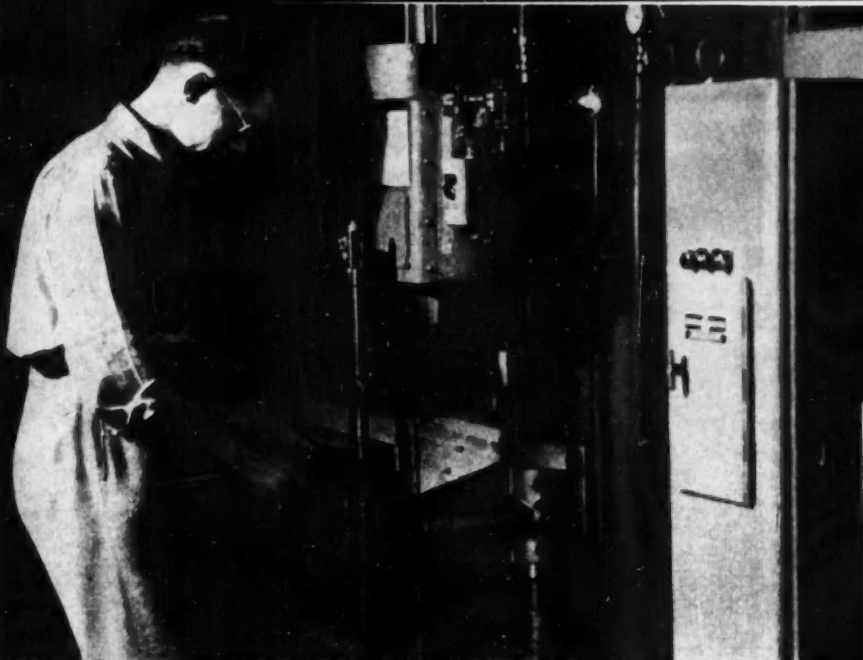
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NO DETRIMENTAL FLASH, SPATTER, OR EXPULSION in welding aluminum or stainless steel assemblies when you use G-E Slope Control. Shown here applied to a G-E synchronous precision resistance welding control, this accessory overcomes the disadvantages of suddenly applied welding currents . . . gives longer electrode life and reduces tip pickup. Slope time dial is at left, heat control setting at right.

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For complete information on G-E control and control accessories for resistance welding contact your nearest G-E Apparatus Sales Office or your welding machine manufacturer, or send in coupon at right.

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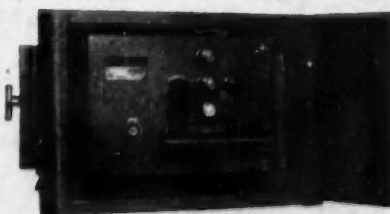
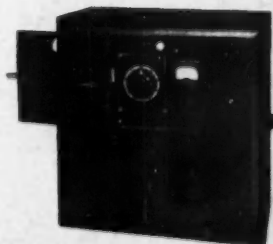
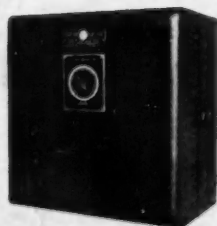
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SINCE 1900

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Readers
are always well
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Sensational Piston Performance

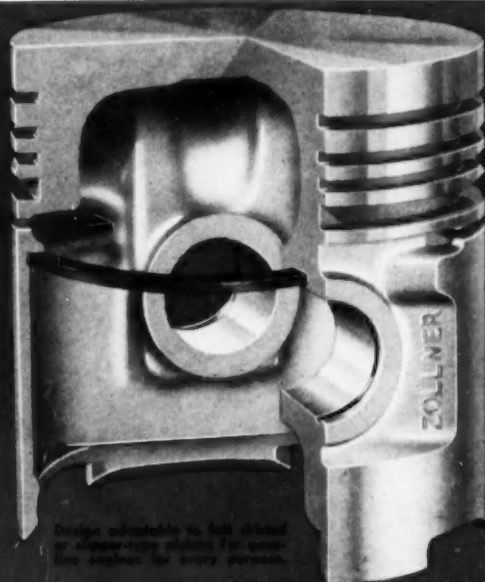
UNIFORM CLEARANCE AT ALL TEMPERATURES

STEEL TENSION MEMBER

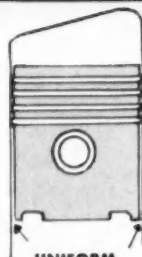
Anchored only at pin bosses
and cast in positive contact
with I. D. of piston skirt

Controls Clearance Automatically

ZOLLNER
CLEAR-O-MATIC
PISTONS



Now, pistons may be fitted to closer clearances than ever before possible. The sensational development of CLEAR-O-MATIC Pistons by Zollner engineers reduces required clearance to less than .001 with constant uniformity of skirt bearing over the entire temperature range. Performance results are spectacular. Engines run quietly with no cold slap. Friction is reduced without loss of durability or heat conductivity. There is no danger of scuffing or seizing. The Zollner designed steel tension member incorporates in the aluminum piston the same effective expansion as the ferrous cylinder itself. We urge your immediate test of these sensational advantages for your engine.



UNIFORM
EFFECTIVE SKIRT
CLEARANCE
AT ALL
TEMPERATURES

- 1 Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
- 2 Effective expansion identical with ferrous cylinder.
- 3 Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
- 4 Normal diametric clearance usually less than .001 with uniform skirt bearing.
- 5 Durability and conductivity comparable to heavy duty design.

ZOLLNER

THE ORIGINAL EQUIPMENT PISTONS

PISTONS

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ADVANCED
ENGINEERING
PRECISION
PRODUCTION

in cooperation with
engine builders

Use 52100 steel for parts like these:

1. Diesel injection pumps
2. Lathe centers
3. Slitting rolls and knives
4. Cam rollers for automotive steering gears
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...and get all these advantages:

1. Hard
2. Tough
3. Machines easily
4. Exceptional wear-resistance
5. High tensile strength
6. Withstands working pressure of 200,000 p.s.i.

BECAUSE it's an alloy steel of high carbon analysis, Timken® 52100 has high tensile and fatigue strength. It's fully spheroidized structure makes machining easier. It has high hardenability throughout its cross section and can be oil quenched to a maximum hardness of 65/66 Rockwell C.

You can get 52100 steel from the Timken Company in all three finished forms: bars, tubes, wire. For your small run or emergency requirements, we maintain a mill stock of 101 sizes of 52100 tubing—from 1" to 10½" O.D. We can ship it in

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You're assured of uniform quality in every shipment because we control quality at every step in production. The Timken Company is one of the world's largest producers of 52100 steel, and America's pioneer producer of 52100 tubing.

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